EPTEMBER, 1932 25 Cents, $1 a Year

7TH TIER

Contractors and Engineers Monthly

Levee Building
in the Mississippi Valley
is a Major Construction Activity
Which Continues in Full Swing

Paving a Cut-Off

A CUT-OFF to save a short distance on U. S. Route 20 about 12 miles west of Buffalo, N. Y., and to preserve the integrity of the road where it was being threatened by the waters of Lake Erie, provided an interesting bit of work. The job was 6.05 miles in length and consisted of four 10-foot strips of 9-inch uniform slab reinforced with wire mesh. The contract was awarded May 15, 1930, to the Harrison Engineering & Construction Corp., and the grading started the same day. As there was practically no heavy grading to be done an elevating grader hauled by a Caterpillar Sixty was used for the cuts, loading to twenty wagons with 3 4-up mule teams. The average haul for the spoil was 1,000 feet with a maximum of nearly 2,500 feet. An Austin leaning wheel grader with a 10-foot blade was used to smooth off the dumps and one man with a team and a fresno worked on each dump. The largest fill was 256 feet long and 19 feet high. All fills were rolled continuously with an Austin 10-ton gas roller. As a subbase for the concrete pavement 6 inches of bank run of slag was placed and filled with cinders.

Fine Grade Operations

After the slag had been graded to approximately final elevation by the Austin grader and consolidated by a 10-ton roller, the form setting crew stepped in and cut the trenches for the forms on the line set by the engineers. Two men were used for cutting the trench and three men for setting double rows of forms and two for single. The Blaw-Knox forms were kept set from 500 to 700 feet ahead of the paver. The fine grade crew consisted of six men with a foreman and a scratch board to check the cross section continuously. Following the grade crew came the Galion-Fordson 5-ton gas roller for final rolling.

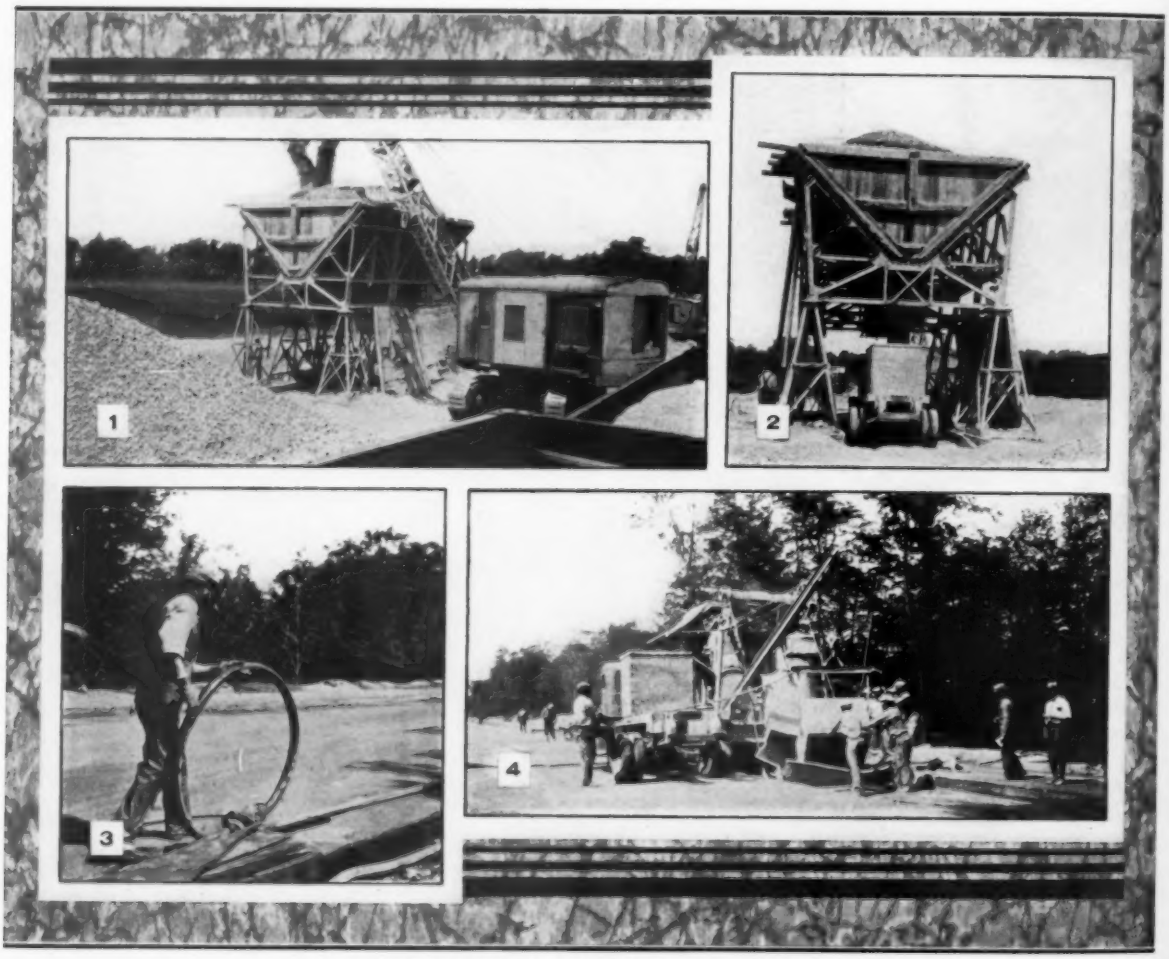
The Contractor Averaged 1,150 Feet of 10-Foot Slab of 9-inch Uniform Section per Day

Batcher Plant Neighborly with Large Cement Plant

The batcher plant was located 5.3 miles dead haul from the easterly end of the job and adjacent to the works of the Bessemer portland cement plant. For ease of handling, the Bessemer cement was loaded in freight cars and shunted over to the batcher plant siding. The slag for the base was shipped by rail from the Lackawanna plant of the Buffalo Slag Co. and clammed out by the Northwest crane with a 45-foot boom and a 1-yard Erie bucket. Gravel came in by rail from the Buffalo Slag Co.'s pit at Attica, N. Y., and sand came from the same producer. All aggregates were handled in the same manner either to storage in stock-

piles or to the three-compartment wooden bins equipped with three pairs of Blaw-Knox volumetric batchers.

Hauling of the batches was let in one contract to a man who hired trucks from several independent owners, although the greater part of the hauling fleet was owned by one organization. Each truck carried two or three Lakewood steel batch boxes and drove direct to the cement car where three men loaded the cement as required. As this project was a two-course pavement, two separate mixes were required, slag and sand for the bottom and pea gravel and sand for the top course with seven and eight bags of cement respectively. A sequence of two bottom batches and one top batch followed by three bottom batches and one top gave the right amount of concrete on the road. From the cement car the trucks drove straight under the batcher and received the required batches. As the batchers were arranged in pairs and most of the trucks were two-batch units these were handled with unusual speed by one man operating all six batchers. The remaining crew at the plant were the crane operator and one man in the cars cleaning up. The trucks then drove through and turned, driving directly out without having to back at any point. This saved considerable time in the truck haulage and cut the number of trucks required to properly serve the mixers.



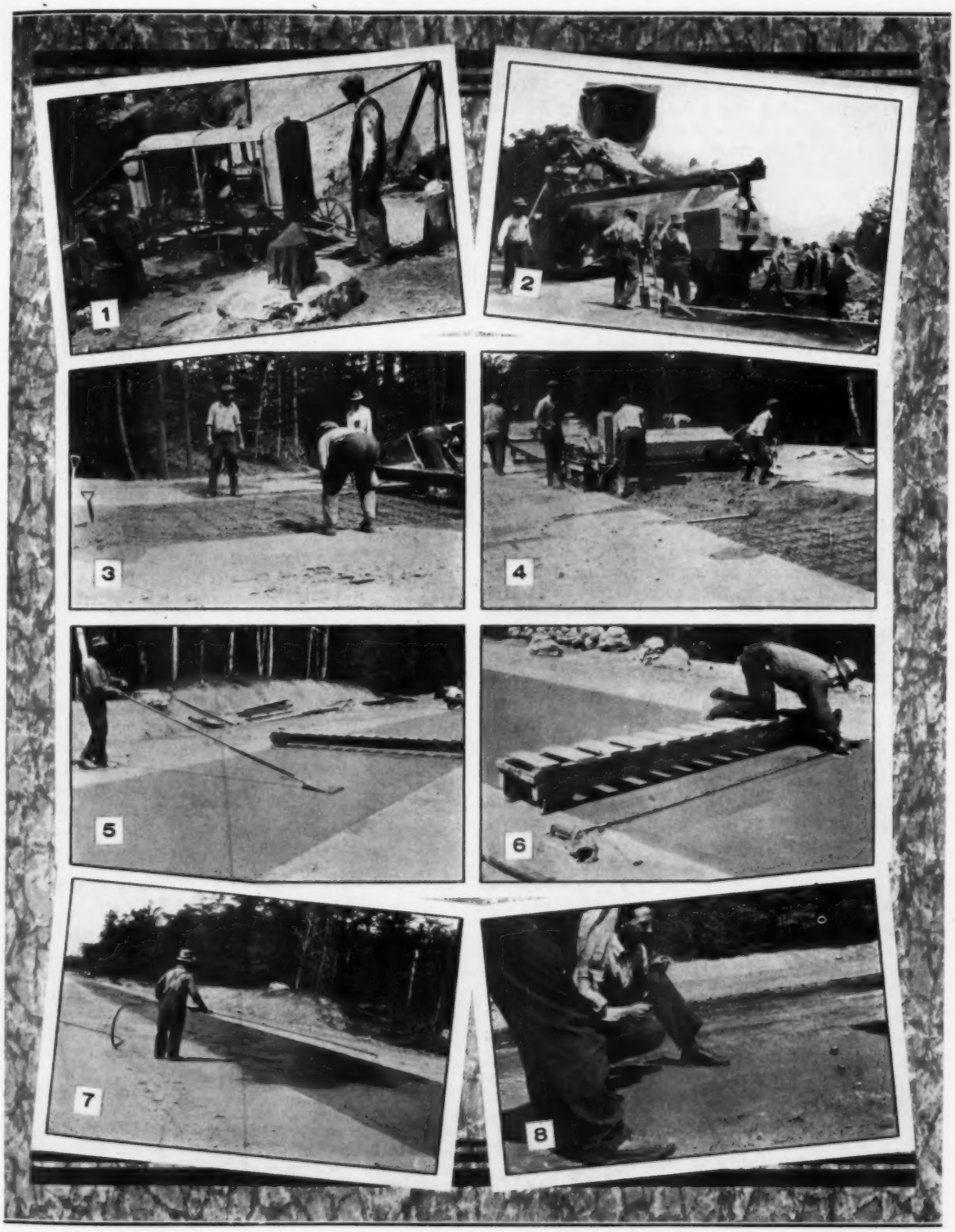
HANDLING THE BATCH FROM CAR TO SLAB

1. Unloading aggregate from gondola cars to the 3-compartment bin. 2. One of the dual-pneumatic trucks with two batch boxes receiving its load. 3. Rolling his own,—and lengthening the life of the paver hose. 4. Dumping a batch box at the paver.

THREE PAVERS FROM AUGUST TO CLOSE OF 1930 WORK

The contractor operated three Rex 27-E pavers for one week, October 11 to 16, 1930, and then used two pavers until the close of the 1930 season. The Harrison Engineering & Construction Corp. failed prior to the start of the 1931 season. C. D. Ream who had been general superintendent in the East organized a construction company and the contract for this road was assigned to him. During 1931 only one paver was operated.

Ahead of the paver one man cut the slots for the Elastite 7/8-inch expansion joint, laid out the joint with the cap on it and placed the dowels ready for insertion after the paver had passed and before pouring. He placed the metal sleeves and supports on the dowels and also oiled the forms. The batch trucks drove direct to the paver as the use of batch boxes eliminated the



PUMPING, POURING AND PLAYING ON A 6-MILE CUT-OFF WEST OF BUFFALO, N. Y.

1. The faithful pump which supplied water for sprinkling and mixing. 2. Pouring the third strip with the paver running in the fourth strip. 3. Placing the reinforcing fabric 2 inches below the top of the slab. 4. At this stage the finishing machine ran on the two adjacent slabs. 5. Putting the broom finish on the top. 6. Edging a joint. Note the method of holding the cap slightly above the surface while finishing the joint. 7. Curing the new concrete with an asphalt emulsion. 8. "Come seven"—truck drivers at play.

need for turning before they reached the paver and had delivered the batches. There were four men to handle the boxes, two swinging and dumping them and two emptying the bags of cement into the skip. There was one man to operate the hoist on the paver for the boxes. The paver operator normally cared for the complete operation of the machine with the exception of the hoist, but at times when the paver was pouring from number 3 slab across number 2 slab to number 1 slab the superintendent would handle the shifting of the paver boom to release the trucks as soon as they had delivered their batches and were ready to drive forward to turn ahead or make a circuit back to the batching plant. The paver boom was long enough to permit pouring a batch 24 feet from the delivery end of the paver. This was used to great advantage in cases such as noted above, which were not infrequent, where sections of slab were omitted on fill. In many such instances the paver carried both the slab in which it was operating and the alternate slab along at the same time. This resulted in doubling the finishing crew as there was no economy in putting in a second finishing machine for a few hundred feet of slab. In these cases the short sections were screeded and finished entirely by hand.

Behind the paver there were two men who touched up the grade, filling and cutting as shown necessary by the scratch board behind the paver. These same men assisted with the water hose when a shift was made, used the hand strike-off to 2 inches below the forms for the placing of the reinforcing fabric, and spaded against the forms. A word about the method of handling the paver hose will be of interest as it is novel. Two hose each 1½ inches in diameter and 300 feet long were carried for each paver. With taps set every 340 feet in the 2-inch water pipe from the Chain Belt Durex pump, shifts were not frequent and when they were necessary they were not arduous tasks. Each hose carried a complete coupling and the extra hose was pulled ahead by the very busy utility truck and attached to the next tap. Then when it came time to shift hose all that was necessary was to pull the end of the new hose across the slab, cut the old hose and attach the new while the skip was up. Then the truck pulled the old hose forward ready for the next shift. This truck also carried gas for the equipment and hauled the thousand and one other things needed around such a job.

Behind the paver after the grade was prepared there were two men to shovel bottom concrete and two men to shovel top concrete after the steel was placed. The men on top concrete also placed the Wickwire-Spencer reinforcing fabric, as well as shoveled to the strike-off on the Ord finishing machine. When top ran a little ahead of the immediate requirements it was carried on the slab until the steel had been placed and then shoveled ahead by hand as the screed could not handle it piled up fully 7 inches on the strike-off without spilling over the edges of the forms or onto the adjacent slabs.

There were three hand finishers one of whom cut the joints, edged the pavement and used the fiber broom to finally roughen the top of the slab to give a non-skid surface. Following the finishers one man applied the Curcrete for curing the concrete and "Amen" was said to all curing troubles. On the hand finish a wood belt was used in addition to the hand floats and a long-handled float.

It was interesting to note that the contractor had a complete crew of negro labor around the pavers and all white labor on grading. With the batch meter set for 1 minute and 27 seconds the pavers averaged 1,150 feet of slab per 10-hour day, running 315 to 320 batches.

A Couple of Details

Watching the concrete crew in action it was interesting to note the little things they did to insure a good job. As an example when the first batch of top concrete was poured on the reinforcing fabric one of the strike-off men would stand on the edge of the steel to prevent its buckling up on the edges. This was a small detail but it prevented any trouble with inspection and the possibility of the fabric being too high in the slab at the edges.

One man was used to handle the empty cement bags which were tossed out from the skip as emptied. He put nine bags into one empty and stacked them along the road, keeping them covered with tarpaulin. As the pile grew and the utility truck had time they were hauled back to the cement plant. Before delivery the bags with nine inside were baled in bundles of five making fifty to a bale. This size was easily handled and readily counted. The same man who looked after the bags helped rustle the Curcrete drums when the machine was being filled and acted as a handy man to run errands when needed.

Personnel

The Harrison Engineering & Construction Corp. was the contractor during 1930 and C. D. Ream, Inc., of Buffalo, N. Y., completed the contract on the last day of August, 1931, under an assignment. G. Kenneth Barber was Superintendent for C. D. Ream, Inc. For the State Department of Public Works, Charles R. Waters was District Engineer and R. M. Howard was Engineer in charge in the field.

Tests of Concrete Hauled from a Central Mixing Plant

TESTS of concrete hauled from a central mixing plant show that the slump was generally about 8 inches as the concrete came from the mixer but decreased very consistently during the time of retention in the truck drum. Even after 2½ hours in the truck mixer, the consistency was such that the concrete could have been used quite satisfactorily for road or pavement work, where the requirements are especially rigid.

The amount of water and the sum of the absolute volumes of the cement and aggregates remained practically constant throughout each run. The amount of cement, however, appeared to increase. As this apparent increase was about the same as the decrease in the absolute volume of the sand, it is likely that it was due to the pulverizing of the aggregates, especially the sand. The apparent increase in cement content in a batch of concrete mixed in a small mixer for 1 hour and 15 minutes was much greater than that in the truck mixer and the stiffening of the batch was correspondingly more marked. There was no indication of segregation of the concrete in the truck mixer as observed visually, or as determined by testing the composition of the concrete.

From a paper by Willis A. Slater, Late Research Professor of Engineering Materials, and published in pamphlet form by Lehigh University, Bethlehem, Penna.

Equipment Maintenance—

An Asset

to Contractors

By
George L. Potts

Potts & Callahan, Contractors
Baltimore, Md.

AN equipment maintenance system is necessary in every branch of business, and we have found that ours has given the maximum amount of performance, service, and advertisement. Our fleet of trucks, twenty-eight in number, consist of twenty-two White's, three G.M.C's, and three Sterling's, all of which are 5-ton dumps, ranging from one to eleven years of age. The two photographs, both of which were taken this year, are of the oldest and newest trucks; Number 1, which was purchased in April, 1921, is eleven years old, and Number 38 was added to the fleet last year. The fact that the Number 1 truck is capable of working day after day with the new trucks is proof of the adequacy of our maintenance system.

Cleanliness Important

Each truck is cared for methodically. It must be washed and polished at least twice a week. After that every part of the truck is inspected to assure mechanical perfection. Each truck must be greased and oiled frequently, daily if necessary. The paint must always appear fresh.

Since this maintenance system includes not only efficiency but also cleanliness, it sets a high standard for the chauffeurs, and each strives to have his truck surpass that of his co-workers in appearance and performance. It is not unusual to see the drivers, during lunch hour, wiping and polishing their trucks. Simonize and nickel polish are provided in order to encourage this friendly competition. This cleanliness is not limited to the exterior of the trucks. Much time is spent keeping the motor clean from grease and dirt. The men pride themselves on the perfect performance of the motors of their trucks, and absolute cleanliness simplifies the tracing of any mechanical defect that may appear. Uniform tire pressure is also insisted upon, as this prolongs the life of the tire.

No. 38—The Latest Addition to the Fleet

No. 1—Eleven Years Old

Truck Performance Improved by Watchfulness

Due to this careful and constant attention, the trucks are able to surpass the average truck in performance. This fact was brought out very clearly during the excavation for the foundation of the Baltimore Trust Building, Baltimore. This foundation was excavated to a depth of 50 feet below the adjacent street level, and it was necessary for the trucks to haul the dirt up a very steep ramp in order to reach the street. At this time most of our trucks were busy on other operations, and we were compelled to hire ten trucks to do the hauling. Only one of these ten hired trucks, which incidentally were of the same make as our own, was able to pull up the steep ramp. That truck was about five weeks old. We then used our own trucks, and every one we used made the grade.

The credit for this additional power was due to the fact that the mechanic insists that the motors must always have the maximum amount of compression. When the piston walls are worn many mechanics make a common error by trying to use oversize rings without having the block rebored. The rings must then be filed in order to be put in position because the piston walls are egg shaped, and the increase in compression is very little. The correct way is to use the oversize rings and have the block rebored to fit the rings nicely. In other words, fit the block. The maximum amount of compression will then be secured. On this one job we were saved considerable expense, because it would have been necessary either to build another ramp, or to provide a stationary hoisting engine for the trucks.

One more benefit of maintenance is the prolonging of the life of a truck. In our line of business, the av-

erage truck is of very little use after four or five years. This is due to the fact that at times the trucks are working for months on land developments, state roads, or operations where they are hauling through mud, sand and rocks in low gear. This type of driving is, of course, very hard on a truck. In spite of this about one third of our trucks are over five years old, and are in perfect working condition.

POWER SHOVEL MAINTENANCE

We also have eight power shovels: three Type B and one Type B-2 Erie steam shovels; one Model 32 and one Model 450 Marion steam shovels; one Model 450 diesel electric shovel and one Model K-37 Link-Belt gas shovel. The shovels must receive as good attention as the trucks. They must be greased, painted, and cleaned at regular intervals. These machines have many exposed gears and wheels which must be kept well greased at all times. We have found that it is a saving to pay the pit men one half hour overtime every day to grease the crawlers. Due to the fact that the shovels are kept in good condition mechanically, we very seldom have a breakdown. This in itself is a great saving because a disabled shovel may tie up an entire operation. Before a shovel is moved to work on a new contract, it is always overhauled and put in perfect working condition.

All the rest of our equipment, consisting of tractors, trailers, bulldozers, road graders, pumps, steam and gasoline locomotives, steel and wooden dump wagons, cars, etc., are taken care of in the same careful manner. Consequently, we are always prepared to do a maximum amount of work at minimum cost.

A One-Man Shanty Where a Laborer Stored His "Sunday-Best" While Working. He Also Cooked His Meals Over an Outdoor Fire. Note the Firewood Under the Table, Protected from a Sudden Thunder Storm.

The 1933 Highway and Building Congress

DURING the week of January 16-23, 1933, ten national organizations representating every phase of the great highway and construction industry of the United States will gather at the Highway and Building Congress in Detroit, Mich. This group will include federal, state, county and municipal officials as well as representatives of every branch of the industry. The combined experience and intelligence of the group will be devoted to determining the place of construction in the new economic era in which the nation finds itself. Among the participating organizations are: the Construction League of the United States, American Road Builders' Association, Associated General Contractors of America, Motor Truck Executives Association, Asphalt Institute, National Crushed Stone Association, National Paving Brick Association, National Ready Mixed Concrete Association, National Sand & Gravel Association and Portland Cement Association.

The program calls for concurrent meetings of the several individual organizations during the first three days of the Congress to be followed by a joint session which will map a coordinated procedure for the entire industry.

Simultaneously with the Congress, an exhibition of highway and building equipment and materials, sponsored by the A. R. B. A. will be held at the Detroit Municipal Airport.

Asphalt Penetrated Piles Resist Sea Water

A METHOD of protecting concrete piles from disintegration due to mechanical action of sea water and chemical decomposition has been developed and used rather extensively on the Pacific Coast, particularly in Los Angeles. The treatment of the piles is a vacuum pressure process quite similar to that used in cresoting lumber. The concrete after curing is subjected to dry air treatment, the temperature being gradually increased at a predetermind rate until it reaches 240 degrees Fahrenheit. After two to four hours at this temperature the concrete slabs or piles are moved into the main treating cylinder which has been preheated and dehydrated under a vacuum. Here the slab or pile is rid of free water and a vacuum is produced in the voids thus created.

Following this the concrete is treated with asphalt. Thoroughly dehydrated asphalt is released into the treating chamber at approximately 250 degrees Fahrenheit, the vacuum being maintained throughout its introduction. When the chamber has been filled with asphalt, the vacuum is replaced by pressure running up to 150 to 170 pounds per square foot and maintained for from 12 to 14 hours. The temperature is then allowed to drop to 200 degrees at a rate depending upon the stone and section of the material treated and the results desired. After the temperature has been reduced to 200 degrees the asphalt is either withdrawn or left in the heating chamber until the end of the pressure period. The piles are then allowed to cool to normal.

This method of treatment, known as the Penocrete process, impregnates the concrete jackets to a depth of 1½-inch. In some cases this depth of penetration may even be exceeded as where the mixture of the jacket or outside of the pile is a very dry one with stone and sand in proportions to allow the asphalt to impregnate to a depth of not less than 1½ to 2 inches.

As large structures of concrete, such as sea walls, cannot be treated in a retort, asphaltic impregnated slabs are now produced in various sizes which can be used in practically every form of concrete construction in contact with marine life and exposure to the disintegrating effects of sea water, and also when in contact with acids and alkalis carried in fresh water, alkalis having proved very destructive to concrete structures particularly in the middle West and Canada.

Paving with Bituminous Macadam *in* Ohio

Old Tar Bound Macadam Widened to 24 and 30 Feet South of Sandusky by Nixon Construction Co. of Bowling Green, Ohio

Spreading Dry Screenings Over the Base Course

THE reconstruction of Route 13 south of Sandusky, Ohio, involved the removal of some of the old tar bound macadam and also the paving with the new bituminous macadam over the old road. The methods used are of interest as they are standard Ohio practice and show the tendency to use machines for some operations in bituminous macadam construction where hand work was formerly used.

Preparation of the Grade

Where the work was over the old macadam the old surface was scarified to 3 or 4 inches below the tar either with the scarifier of the Galion Master roller or with a Carr scarifier pulled by a Caterpillar Thirty. The broken bituminous material was then shaped up with a Galion multiple blade maintainer pulled with the Thirty and then rolled with the Galion 12-ton roller. The large material that had been compacted was filled with dry screenings spread uniformly from the tailboard of the trucks by a Stolle Junior spreader. The screenings were then rolled until the voids were all filled and then finally waterbound.

On sections where the excavation for the new grade removed all the old tar road or where there was considerable fill over the old road the grade was shaped with the grader and rolled. This was done on all sections where the old road was widened.

The Base Course

Two 4-inch base courses were laid before any work was done on the top. Forms for the base courses were made of 2 x 4's nailed to form an L 5¼ inches high. The space between the forms which was either 24 or 30 feet, according to the section being paved, was filled with No. 1 stone of screen sizes from 1½ to 4 inches by dumping from the tailgates of the large trucks which hauled from the Wagner quarries on the job. This stone was distributed by Galion spreaders. The 5¼ inches of limestone rock was keyed with the 12-ton roller and packed to 4 inches and then filled with No. 7 and No. 5 material until solid. The first were screenings and the latter, ⅜-inch stone. These were spread by the Stolle spreaders and when rolled dropped into the voids of the large stone and gradually filled them. When the voids were all filled the base was waterbound and rolled until ⅛-inch of grout was carried by the rolls. Before any rolling of the large stone was done the forms were removed and carried ahead for the new construction. The second base course was completed in the same manner as the first, giving a compacted base 8 inches thick.

The Top Course and Penetration

The top course of Special No. 2 stone of screen sizes from 2 to 3 inches was spread by the Galion stone

spreaders and rolled to a 3-inch thickness. This was penetrated with 3.0 gallons of asphalt furnished by The Ohio Road Improvement Co., of Columbus, Ohio, and applied at a temperature of 350 degrees Fahrenheit. A pressure distributor was used. The penetrated section was immediately covered with ¾-inch stone by the Stolle spreaders working backward so that the truck wheels would not pick up the asphalt. Then the surface was bladed with the multiple blade maintainer and finally rolled. No seal coat was applied.

LABOR ORGANIZATION

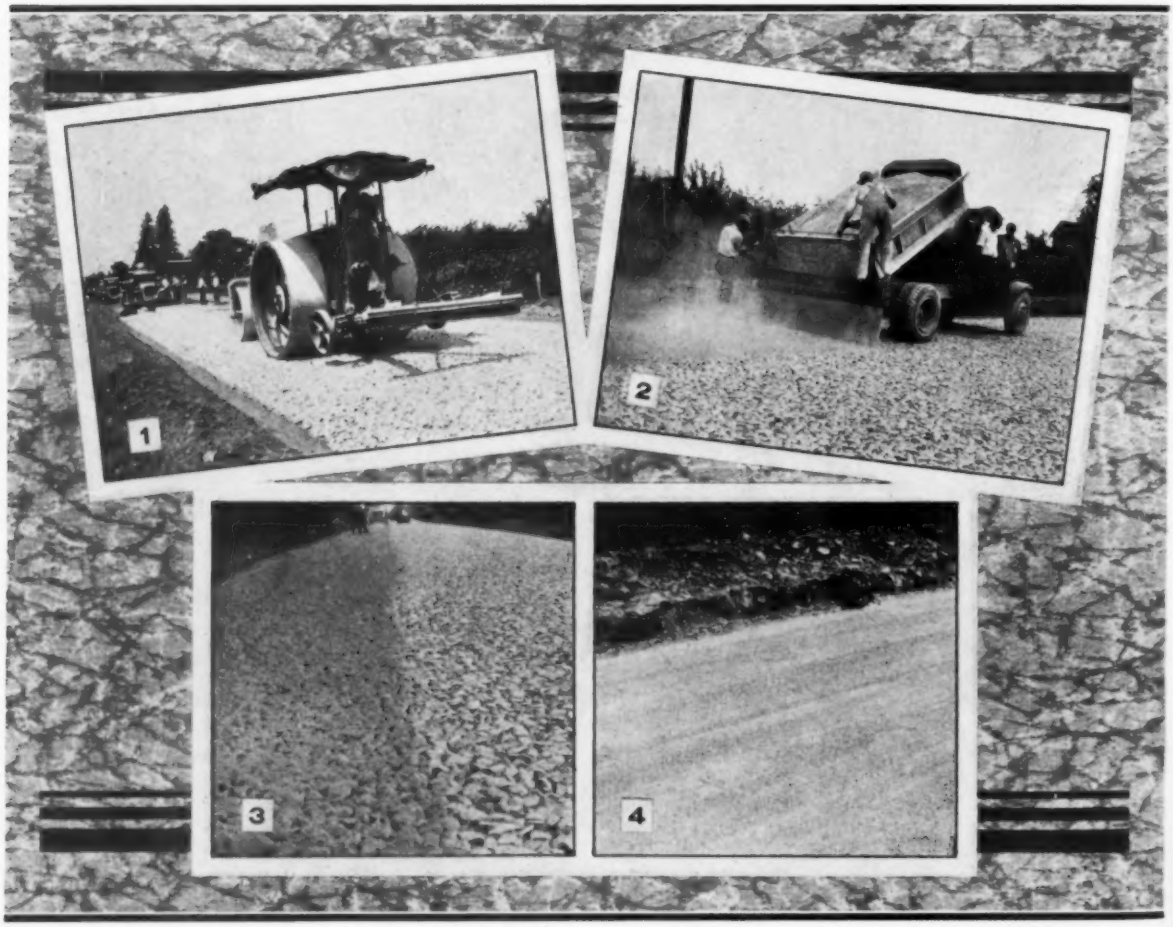
About ten men were used on fine grade preparing it for the stone. As soon as the coarse stone was spread by the stone boxes a crew of six men trimmed and leveled the stone, filling any open sections by hand. They used shovels, forks and "mules" or small rakes with two handles so that the stone was worked back and forth rapidly by two men using the same tool. The Stolle spreaders were worked by two men and the stone spreaders were also handled by two men who alternated between the two which worked in parallel down the road. The entire crew worked with hand brooms as necessary to sweep the screenings into the voids of the coarse stone. There were three rollers used, the 12-ton Galion with 24-inch rollers, and two 10-ton machines, a Huber and an Austin. The final grade was carried to a 2½-inch crown and checked with a contour board having two handles to make it easy to manipulate.

PERSONNEL

This work was done by the Nixon Construction Co., of Bowling Green, Ohio, under the personal direction of John Nixon and Robert Nixon. H. F. Gerold was Resident Engineer for the Ohio Department of Highways.

Newest Methods of Levee Building

Beginning in the October issue of CONTRACTORS AND ENGINEERS MONTHLY *there will appear a series of articles on different methods employed by leading contractors in levee construction and enlargement between Memphis, Tenn., and Vidalia, La., on the east and west banks of the Mississippi. These include practical articles on crawler wagon outfits, an industrial railway job, a walking dragline, a tower outfit and the latest development in levee construction equipment—the belt conveyor.*



METHODS AND RESULTS IN BUILDING A PENETRATION ROAD NEAR SANDUSKY, OHIO

1. A gas roller compacting the first base course. Note the broom on the back of the roller for spreading the screenings uniformly. 2. Distributing the screenings over the base by a mechanical spreader suspended from the back of the truck. 3. Appearance of the base course before and after the application of the screenings. 4. The base course after the screenings had been thoroughly spread and rolled.

Drilling *and* Blasting *in* Highway Grading

Part I

Reported by
Andrew P. Anderson
Highway Engineer
Division of Management
U. S. Bureau of Public Roads

THE rate of power-shovel operation in highway grading depends on three factors; the average length of the dipper cycle, the amount of material handled or moved per dipper load and the regularity or continuity of operation. Poor blasting usually means large rocks and also, very frequently, tight or even some unbroken ground. Large rocks can only be handled with much difficulty and at a very slow rate. Still further delays are often imposed on the shovel while the larger rocks are being redrilled or while the unbroken ground is being reblasted.

On the other hand, where the blasting has been so thorough that the largest dimension of the larger fragments or particles does not exceed but about one-half of the smallest inside dimension of the dipper, the rate of shovel operation can be practically the same as for operation in good common earth excavation. The average amount of pay material moved per dipper load, however, will nearly always be less when working in rock than when working in good common earth excavation because rock generally takes on more swell from blasting and from being picked up by the dipper than does ordinary earth picked up by the dipper from its natural place in the cut. Even with the most perfect blasting the rate of production in pay yardage can rarely, if ever, be expected to be as high as can be achieved in good common earth under similar conditions and with equal effort. The same rate of shovel operation can be attained, and, under favorable conditions, the same apparent, or loose-volume yardage; but the actual or pay yardage measured in place in the cut will probably always be less for the rock than for good earth. Very sticky materials or earth mixed with many roots or boulders may give much lower production than well-blasted rock, as to both size of dipper load and actual yardage per hour of operation.

"Poor blasting is the rule rather than the exception in much of our highway grading work. This conclusion is based on a study of seventy-one power-shovel grading jobs on which solid materials requiring drilling and blasting were encountered in considerable quantities. On forty-three of these jobs the blasting was decidedly deficient. On thirteen of these jobs the material was fairly well broken, while on only fifteen, or slightly more than one-fifth, was the material so well broken as to permit rapid and fairly continuous shovel operation."

—Andrew P. Anderson.

Poor Blasting Reduces Production Fifty Per Cent

As the thoroughness of the blasting decreases, the rate of production decreases rapidly. For all jobs studied during the past three years, the average operating cycle of 1 to 1¼-yard shovels working in materials classed as well to fairly well-blasted rock was 23.5 seconds, while for the same size and type of shovel operating in poorly blasted materials the average shovel cycle was 33.5 seconds—an increase of over 42 per cent. On a few jobs, not included in the above averages, the average shovel cycle was 45 seconds—an increase of more than 85 per cent over well-blasted materials.

The effect of poor blasting on the average quantity of pay material moved per dipper load is almost equally striking. For the 1 to 1¼-yard shovels the dipper load averaged 0.70 cubic yards of pay material in well-blasted rock but only 0.50 cubic yards in poorly blasted materials, a reduction of over 28 per cent. On a few jobs not included in the above averages, because of exceptionally poor blasting, the output was only about 0.4 cubic yard of pay material per dipper load for a 1⅛-cubic yard dipper, a reduction of over 40 per cent. The average reduction in the rate of production for 1 to 1¼-yard shovels, not including exceptionally bad jobs, was therefore approximately 50 per cent, simply because of the decreased dipper load and the increased shovel cycle resulting from poor blasting of the material.

This 50 per cent decrease in the rate of shovel production resulting from an increased shovel cycle and a decreased net dipper load does not include all the effects of poor blasting on the rate of production. More time is always lost on poorly blasted jobs than on jobs where the blasting is well done. This is brought out fully in the first table, which is a summary of the production studies during the past four years on twenty jobs using ⅞ to 1¼-yard shovels. Here it will be noted that the delays or individual stops due to one item alone, namely large rocks, were increased almost 50 per cent on the poorly blasted jobs, while the hourly production for the time the crew was on the job was reduced to less than one-half of that attained on the jobs on which the

A Good Shovel Plus a Good Operator Can Handle Rocks Like This But the Cost Puts This Kind of Blasting Into the Luxury Class

blasting was thorough.

AVERAGE RATES OF PRODUCTION AND OPERATION ON 20 ROCK JOBS

Condition of Blasted Rock for Handling by Shovel	Average Size of Shovel Cubic Yards	Average Dipper Load Cubic Yards	Shovel Production Hour Cubic Yards	Dippers Number	Per Cycle Seconds	Percentage of Working Time Lost by Shovel Due to Large Rocks
Good	1.02	0.68	65.5	96.3	24.4	8.7
Fair	1.08	.49	38.7	79.7	32.2	14.5
Poor	1.12	.50	31.8	63.3	36.7	16.3

SHOVEL COST PRACTICALLY INDEPENDENT OF PRODUCTION

The reduction of some 50 per cent in production simply because the material was poorly, instead of thoroughly, broken would not be so bad if the cost of shovel operation could be reduced in about the same proportion. This is impossible. The cost of shovel operation exclusive of the hauling is practically constant so long as the crew is out on the job, regardless of whether production is high or low, and with the present prevailing equipment and methods of operation even the hourly or daily cost of the hauling equipment tends to become fairly constant and only partly dependent on the rate of production. Every decrease in output, therefore, tends automatically to register as an increase in the unit production cost.

The following example illustrates the point in question. The records show two 1-yard shovels each of which had an average operating cost of about $21 per hour for loading, hauling and dump operations. At one time during a full week while one of these shovels was working in well-blasted rock at an average rate of 67 cubic yards per hour, the other was working in poorly blasted rock at an average rate of only 36 cubic yards per hour. It cost the contractor, therefore, 31.33 cents per cubic yard to load, haul and place the well-blasted material as against a cost of 58.33 cents per cubic yard to handle the poorly blasted material, a difference of 27 cents per cubic yard. It seems probable that if a part of this 27 cents had been expended in obtaining a somewhat closer spacing of the drill holes and the use of a slightly larger amount of explosive a considerable saving would have been effected.

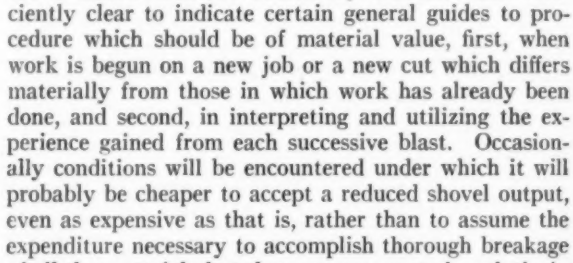
In this case, which was fairly typical of average conditions, the contractor, as is usually the case, was unable to reduce his hauling equipment or his dump crew while working in the poorly blasted material. Poor blasting almost invariably gives rise to poor hauling conditions, the main results of which are a slow hauling speed and difficult dump operations. These conditions call for proportionately more hauling equipment. Furthermore, poorly blasted material is seldom uniform. There are, therefore, periods when the rate of production is high enough to demand the normal supply of hauling equipment and other periods when production is so low that most of the hauling equipment is idle. The wear and tear on all the equipment is excessive when working in poorly blasted material. Time losses and delays due to mechanical troubles are also more frequent. The question, therefore, naturally arises as to how and to what extent these losses can be prevented or reduced without incurring corresponding costs.

THE QUALITY OF BLASTING

It is recognized that under the many widely varying conditions encountered in the field, and with the present knowledge of the art, not all blasts will produce the much desired thorough shattering of the material, and that no rules or formulas can be given which will fit all conditions. On the other hand, it is believed that the available data are sufficiently extensive and sufficiently clear to indicate certain general guides to procedure which should be of material value, first, when work is begun on a new job or a new cut which differs materially from those in which work has already been done, and second, in interpreting and utilizing the experience gained from each successive blast. Occasionally conditions will be encountered under which it will probably be cheaper to accept a reduced shovel output, even as expensive as that is, rather than to assume the expenditure necessary to accomplish thorough breakage of all the material; but these cases seem to be relatively few.

In general, the data indicate that on a large majority of grading jobs involving solid rock, hard shale, or similar materials, more thorough blasting is possible, and that such blasting will tend to decrease rather than to increase the total unit cost of moving the blasted material.

(*To be continued*)



Under Average Highway Conditions Poor Blasting Such as This Will Increase the Cost of Handling the Rock as Much as 25 Cents Per Cubic Yard

A Short *and* Unusual Tunnel

Tunnel Section Showing the Character of the Rock at the Entrance

100 Feet of Sewer Tunnel Produced 3 Kinds of Rock on Outcrop Near Princeton, N. J.

IN the construction of the trunk sewer for Princeton last winter the contractor who handled the larger pipe, Vincenzo DiFrancesco of Llanerch, Pa., had a very interesting problem in the 100-foot rock tunnel on the estate of the late Hobey Baker of Princeton hockey fame. The 13½ miles of trunk sewer went through 62 separate parcels of property of different owners, each of whom deeded the right-of-way for the sewer through his property without cost to the Borough of Princeton. Many of the properties were estates of considerable beauty along the shores of Lake Carnegie and the construction of a sewer meant the loss of gardens and shrubbery for one season at least.

On the Baker estate, now owned by a brother of Hobey Baker, an attractive outcropping of rock immediately above Lake Carnegie would either have had to be done away with entirely or tunneled. As the Borough did everything to cooperate with the owners and as they in turn considered the outcropping as a landscape treasure of no small value plans were made to tunnel. The rock at the southerly end of the ledge was a red shale which was well seamed and with no dip, the strata being nearly horizontal. Drilling was very difficult. In blasting it was necessary for the contractor to hold down the loading of the holes so as not to blow the entire section into the Lake.

Tunneling Operation

The tunnel was about 100 feet long, 6 feet high and 4½ feet wide. Drilling was carried on from both ends using one I-R and two Schramm compressors and two drills at each end. The extra compressor was used to furnish the air needed for blowing out the holes before loading. A round of 10 holes was drilled in the face ranging from 4½ to 6 feet deep and then blasted with du Pont 40 per cent gelatine dynamite, using delay caps for the top and bottom holes. After the shot the two drillers turned muckers and loaded the shattered rock with stone forks into one wheelbarrow at each end which was shuttled back and forth by one man.

The last 8 feet of the tunnel was drilled from both ends and shot at one time from both ends. The entire tunnel operation took about two weeks of drilling. About 30 feet of timbering was necessary in one section where the rock seemed to crumble more easily. For about 10 feet there was a single slab of rock that formed a flat roof for the tunnel.

Personnel

The contractor for the larger sewer pipe trenching and laying on the Princeton project and for this short tunnel was Vincenzo DiFrancesco of Llanerch, Pa., for whom George DiFrancesco was directly in charge of the work and D. H. Whitmer was Engineer. The work was in charge of I. Russell Riker, Resident Engineer for the Sewer Commission of the Borough of Princeton.

Two Complete Concrete Outfits

Two 10-Foot Widening Strips, Two Grading Crews, Two Fleets of Batch Trucks, Two Pavers, Two Finishing Machines and Two Sets of Finishers

ROUTE 4 from Chicago west is the direct through route to St. Louis. The old 20-foot pavement was inadequate to carry the heavy through traffic as well as the heavy local traffic for this is a section with many suburban golf clubs and country clubs. The Illinois Division of Highways decided to widen the pavement with two 10-foot strips of the standard 9-6-9-inch section, making a new pavement 40 feet wide. It was essential that this work be completed as rapidly as possible because the detour for this heavy traffic was a road already heavily traveled. The contract was awarded to the Arcole Construction Co. of Niles Center, Ill., and as soon as it was known that the Arcole organization would handle the work, they were called into consultation to devise means of speeding it up. Arthur K. Levy, President of the Arcole organization, quickly decided that it would be well to use two pavers, not in the tandem formation which was used so widely in Minnesota and Iowa, nor even to work two outfits from the two ends of the project. He decided to put two pavers in parallel with a complete service for each as though they were at widely separate points. This was carried out with the exception that the batching plant was common to the two fleets of batch trucks. The pavers and trucks used the center 20-foot strip of old pavement to run on and thus speed was possible in the hauling.

Preparing Two 10-Foot Grades for the Widening

The shoulders of the old pavement were removed by an elevating grader working in the section to be paved and loading to a fleet of four to seven International trucks which hauled an average of 1,000 feet to dump for filling low spots in the shoulders which were to become grade or to make the new shoulders. An Austin 36-inch elevating grader pulled by a Caterpillar Sixty was used to cut the shoulders and load the trucks. The crew on this work, in addition to the truck drivers, the tractor operator and the grader man, consisted of one dump man and a helper on stakes and a foreman.

Aggregates Received via the Chicago Drainage Canal

We have seen one attempt to use a canal owned by a government bureau for the handling of aggregates and it resulted in great delays to the contractor. In this case, however, the contractor was well supplied with aggregates at all times and did not have to unload the barge that delivered the material. About 4,000 tons of sand and stone in the correct proportions were brought to the site of the batching plant on the bank of the Chicago Drainage Canal about a mile south of the junction of Route 4 and 54. The materials were loaded separately at the plant of a materials supply company at Lockport, Ill., near Joliet and the self-propelled barge then came up the canal and unloaded itself in five hours by means of a conveyor and boom. The materials were delivered directly to the two stockpiles of the contractor at any time of the day or night as the barge carried its own illumination and worked on a 24-hour schedule delivering to this and several other material and contracting units. The deliveries for this job were made about every 48 hours.

The sand and gravel were rehandled from the stockpiles by a Marion shovel and a 1-yard Owen clamshell bucket to the Johnson wooden bins and batchers. The individual batches consisted of 2,612 pounds of gravel, 1,501 pounds of sand, and six bags and 33½ pounds

Equipment Run *in* Parallel *on* Widening Job

of cement to give a yield of 28.35 cubic feet of concrete. The organization at the batching plant was a minimum in spite of the fact that they were serving two pavers, as the aggregates were handled only from stockpiles. There was the crane man, and the batcher man, and one clean up man around the stockpiles.

Splitting the Odd Bag of Cement

The fleet of thirty 3-batch trucks which was divided between the two pavers and did the hauling by subcontract had a dead haul of 2 miles from the batching plant to the road and an average of 3½ miles live haul. From the batching plant they drove out onto the main highway and then into a spur where the cars of Marquette cement provided by the state were spotted. Three men worked in the car being used to supply the full bags of cement and two men in the car where the sacks were split to provide the 33½ pounds more than the six sacks. In this car the men had a Fairbanks platform scale and a bag hanger made of pipe to form a standard so that the bag could be filled without spilling half the cement in the attempt. The bag was then lifted from the standard, weighed and corrected and then the end folded over and the sack placed outside on the platform ready to be tossed onto the truck as needed.

Here the Organization Splits

Except for the fact that the two sets of batch trucks used the same 20-foot pavement for driving up to their respective pavers, there might have been an invisible wall dividing the two organizations which paved the two widening strips. They were exact duplicates except that the pavers were of different makes, one a Koehring and the other a MultiFoote, but both 27-E machines.

The organization to be described will be for one side only and any exceptions will be noted in the text. The fine grade crew for one side had a Wehr one-man power grader with an 8-foot blade to cut the trench to the proper cross section and this was used to pull the Carr subgrader on the forms after they were set. There were

A 36-Inch Elevating Grader Made the Cut for the Second Concrete Strip While Trucks Ran on the First

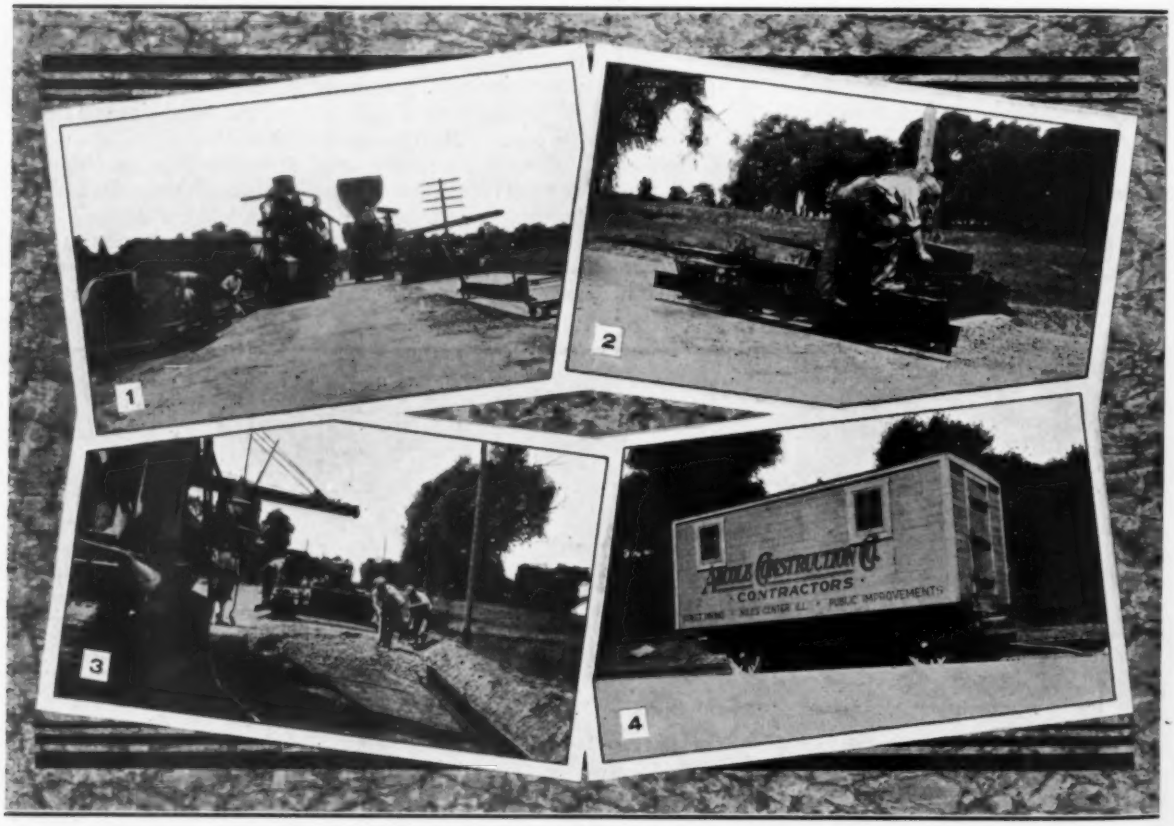
Weighing Out Part Bags of Cement in the "Shade" of a Box Car

4,000 feet of Truscon 9-inch forms for each side and these were set by two men. There was a Ted Carr Form-grader to cut the trench for the forms and three men on fine grade in the 10-foot strip. The fine grade was kept 1,000 feet ahead of the paver and was not cut by any trucks as they worked on the pavement except where they turned. In these places well-built wedge-shaped platforms of 8 x 8-inch and 6 x 6-inch timber were placed with short lengths of lumber between to make them lighter. An Austin Pup 5-ton roller compacted the grade and left a smooth firm grade for the slab.

One man set the ⅞-inch marginal bars along the form, there being none against the old concrete. He also oiled the forms and the steel. No center steel was used in the center of the 10-foot widening strip nor against the old slab. There was a dump man for each paver, and the pavers carried an operator and a helper. The paver pulled a Carr scratch template but no subgrade planer and the two final graders had little to do except sprinkle the grade on each move of the paver. The three puddlers also spaded against the forms, and managed to get around very well without being in each other's way in the narrow working space.

The Ord finishers were regular machines cut down to the narrow width and geared up for higher speed. All the old parts were saved so that the machines could be reassembled as standard 20-foot machines for other work last or this year. Two men with a 10-foot longitudinal float handled the smoothing off of the slab and did the belting. There was an edger and two finishers who used the drag and the checking straight-edge and, when needed, the 3-foot long-handled floats. This work was done under the new specifications that penalized the contractor for all bumps in the pavement over ⅛-inch.

In this case the work was particularly difficult as the contractor did not have forms on both sides of each



SOME OF THE DUAL OPERATIONS ON THE ROAD

1. A view from the concreting side of the two pavers showing the pair of finishing machines. The pavers were separated at all times by a space sufficient to permit service trucks to drive through. 2. One of the mechanical finishers with the planed steel channel iron master straight-edge at the side used several times a day to test the checking and drag straight-edges. 3. Accessories to the paver—a slump cone, an extra shovel for the grade man and a bucket for checking the accuracy of the water measuring device on the paver. 4. One of the tool houses mounted on an old truck chassis.

widening slab but had to use the old slab as one side on which to run his finishing machine. The old pavement not having been completed to the same rigid specifications, the contractor had to take extra pains in finishing the slab.

There were two burlap men on each side who spread the burlap from a rolling bridge. Two other men sprinkled the burlap and then the burlap men went back and the following afternoon took off the burlap and spread the Columbia calcium chloride after three o'clock, according to the specifications.

TWO PUMPS AND TWO PIPE LINES

The dual character of the job extended even to the pumps, two of which were used to supply the pavers through two separate pipe lines laid along their respective shoulders. On one side a Jaeger triplex pumped steadily and on the other a C H & E kept its paver in operation without delays. Both pipe lines were 2½ inches in diameter and had the valves for the paver hose connections put in at intervals of 400 feet. The pavers carried 300 feet of 2-inch hose. The valves were left in the line after the pavers had passed for the use of the sprinklers.

OTHER DETAILS

As the trucks pulled up the grade and before they turned off the slab they stopped about 1,000 feet from the pavers. At either side were platforms standing on horses on the grade. Two men on each side stepped onto the trucks and emptied the cement bags onto the batches.

One of the finishing machines carried a steel channel iron about 6 inches wide, the top flange of which had been machined to a perfect edge. This 10-foot channel was used as the master straight-edge for testing all the checking and drag straight-edges on the job every morning and several times a day. The forms were straight-edged every morning by the inspector to see that there was no deviation of the top surface of any section from a straight line.

One man on each side pulled the forms and then two trucks, one for each side with two helpers, loaded and hauled the forms ahead to the setters. On the grade ahead of each paving crew and just behind the fine grade gang, there was a complete tool house mounted on the chassis of an old truck. It was used for the storage of small tools with racks for the shovels, sledges, picks and mattocks. There were hooks for the work clothes of the men and at night it was used as the watchman's shanty.

On many widening jobs in the past it has been the practice to run one paver facing one way and the second the other way and thus work from two directions. In this case the pavers both headed in the same direction and all hauling was from one direction. When the two pavers had passed a certain point they had completed the full 20-foot width of pavement widening and left a complete 40-foot roadway that did not have to be traversed again by the pavers. This organization produced 1,700 feet of 10-foot widening strip for each paver during each 9-hour paver day.

PERSONNEL

This interesting organization and work were the product of Arthur K. Levy, President, of the Arcole Construction Co., of Niles Center, Ill. Henry Hoover was Superintendent for the company on this work and C. C. Irving was Resident Engineer for the Illinois Division of Highways.

Hauling Dirt for the Madden Dam in Panama

OVER one million yards of dirt are being moved at the Madden Dam which will impound more water for lockages for the Panama Canal. A. J. Ackerman, Chief Engineer for W. E. Callahan Construction Co. and Peterson, Shirley & Gunther, has made an interesting report on the handling of dirt with tractors and crawler wagons on this job.

He writes, "During the dry season extending from December to April the Sixtys worked on saddle dams which serve to fill up low arroyos and form walls in the reservoir area. Pulling tumble bugs, they first stripped the various dam site areas, sometimes working on slopes as steep as 45 degrees. Then the embankments were commenced and the Sixtys went about their business in earnest, pulling one and frequently two, 6 or 8-yard wagons. The material was deposited in 2-foot layers and was thoroughly compacted both by the action of the Sixtys themselves and the use of a sheepsfoot roller."

With the onset of the rainy season the Caterpillars and wagons were moved to the main dam site where there were some 260,000 yards of common excavation and 175,000 yards of rock excavation. And here the tractors met their first real test for they were fighting rain and mud,—in a country where 90 inches of rain may be expected to fall in eight months.

Gravel roads were first built to help the tractor pull their heavy loads over the rain soaked ground. For sixteen hours each day the tractors battled the mud and rain, crawling over huge rocks, slushing through knee deep water, squirming and wriggling through sticky mud. Soon even the gravel roads could not withstand the heavy loads and the incessant rains. So the contractor built a timber road extending from the pit to the waste pile and now the Sixtys crawl over 12 x 12's with their pay loads and use gravel roads for returning to the pit.

Concrete Lagging Replaces Wood Lining on Chicago Foundation Caissons

A NEW method of lining the caissons for the foundations for skyscraper columns has been used in the second unit of the new Field Building, now being erected at LaSalle and Adams Streets, Chicago, Ill. The new process utilizes reinforced concrete lagging instead of the familiar wood lining for the well or caisson. The cross-section of the concrete units resembles the letter "T." They are placed around the walls of the well as it is dug and eventually become an integral part of the pier. The tops, or flanges of the "T's" are placed against the earth. Tongues and grooves along their edges enable them to interlock longitudinally. The lower portion or stem of the "T" projects inward and is of increasing width as it extends away from the flanges. This dovetail feature locks them securely into the pier concrete as it is placed. This method provides a saving in excavation since the diameter of the well need be no larger than the specified diameter of the pier. When wood linings are used, the excavation had to be larger to allow for the lining.

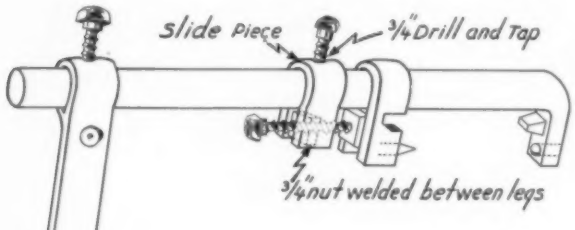
A patent application is now on file by S. G. Martin, Civil Engineer for this project. The new Field Building which will be 42 stories high and will be Chicago's largest office building was designed by Graham, Anderson, Probst and White, Architects. The George A. Fuller Co. is the General Contractor and the W. J. Newman Co. the sub-contractor on the caisson and foundation work.

How the Other Fellow Did It

Construction Briefs

Interesting Clamp Foot

174. A contractor in Kansas recently developed a clamp foot which has proved particularly advantageous for clamping an "old man" to most any structural shape where there is no hole available to start drilling. The clamp requires but two extra pieces which can be easily made on the job. It consists of a loose movable foot with V-shaped slots cut in such a manner as to pull the bar tightly against the flange of the I-beam when it is shoved down with a screw block. The movable foot is made of ½ x 2-inch bar iron with a piece welded across the top to receive the thrust of the screw. The screw block was made of the same material bent in the shape of a horse shoe. A piece was welded between the legs to make the block slide snugly along the bar. A ¾-inch standard nut was welded to the back of the slide piece and also to the legs. A hole was drilled and tapped in this piece to clamp it to the bar. Two hardened steel spur points were set in the movable foot to enable it to be clamped down on the smooth face of the beam where necessary. By reversing the blocks it is possible to clamp the device between beam flanges. A block was welded to the inside of the bar foot as shown to form a slot for the flange.



Details of a Novel Clamping Device

Bucket of Grout for the Finishers

175. A Georgia contractor who has always felt the responsibility for producing the smoothest pavement possible and who believes that this is accomplished finally by the longitudinal float has developed an interesting method of being sure that the float does the trick. Grout is shoveled from in front of the second screed of the mechanical finisher and is used for touching up low spots brought out by the float. The grout is carried along as needed in a bucket and then thrown onto the slab at the points where the longitudinal float shows it to be a bit low. This scheme works out very well indeed, as there were mighty few cases where the straight-edge shows any low spots after the longitudinal floating is completed. 22.2.55

Dropping a 4-Foot Caisson with Shot Gun Shells

176. Some of the old timers among our readers may recall the use of the method we are about to describe as having been originated in the sinking of steel cylinder caissons in the Mississippi River a good many years ago. The method has been revised in the sinking of small caissons in some quite recent work in Tennessee and it seems worth while to describe the method in some detail as it may have considerable application outside of the Mississippi valley and Tennessee. On the job in question in eastern Tennessee, 4-foot caissons consisting of steel cylinders 20 feet long were to be sunk as one pier of a 30-foot runway carried out into a stream to support two 12-inch cast iron pipes which were used as a water works intake and also as supports for the pump house foundation. The cylinders were set up in place, a platform built on the top and the material excavated from the bottom was piled on the platform. Suitable guides were erected around the caisson to keep it straight when sinking.

When the water came in too fast at the bottom through the gravel so that men could not excavate the material at the lower or cutting edge of the caisson, shot gun shells were used to help the sinking of the cylinder until it sealed itself. Number 10 empty shot gun shells loaded with dynamite and exploder and a 4-inch fuse were made up. With a considerable number of these loaded shells by his side a man on the platform on the top would light one of the fuses and drop the shell into the water. When the shell exploded in the water the caisson would drop from ¼ to ¾-inch. The use of the exploding shells was continued until the cylinder would settle no further, then the excavation was started again until water began to enter, when the bombing with shot gun shells was repeated. This was continued until the cylinder was sunk to the depth required. In the sinking of one of these cylinders considerable difficulty was experienced with sand running into the base of the cylinder when the gravel bed was struck. In order to overcome this, the cylinder was permitted to fill with water instead of being pumped out continuously. This water equalized the pressure, then the sand was pumped out with the same pump and the concrete base was poured with a tremie. Later the water was pumped out and the remainder of the concrete poured in the dry.

Whole Soles on the Job

177. This is an idea for building contractors and others where a large amount of form work is required. A building contractor who is out on his own work, instead of being so big that he just sits in his office, makes an inspection of the shoes on the men on his job each morning to locate men who are wearing sneakers or shoes with holes in them or with particularly thin soles. This idea of a shoe inspection perhaps sounds silly, but there is no reason why the foreman on the job, with orders from the Superintendent, should not make such an inspection every day, especially where there is a lot of slash or nail hazard on the job. This will mean eliminating a great many foot injuries and possible cases of tetanus or lock-jaw. 22.2.106

Blanket of Ice Kept Concrete Warm

178. Who says contractors are not ingenious? Were they not well supplied with ingenuity they would not long be in business. Out in Missouri where they were pouring 600 cubic yards of concrete in a single working day for a big floor slab, the weather man forecast a drop in temperature to about 15 degrees below freezing. With a good organization the contractor finished the job with two working hours to spare and tucked the green concrete away for the night under a blanket of ice. This blanket was made by spreading a 6-inch layer of straw over the newly poured concrete and spraying the top with water which quickly froze into an air-tight sheet in the frosty air. Underneath the slab coke-burning salamanders were used and above, the straw supported the film of ice that sealed the air chamber. 22.2.96

Transit-Mixed Concrete *for* 260-Foot Culvert

Smith Paving Company Used Nine Mixer Trucks on 20-Mile Haul for 1,379 Cubic Yards of Concrete

TO do away completely with the handling of aggregates in relatively small quantities in a bad location for building the largest culvert on a double-width 20-foot concrete paving job 2.663 miles long, the Smith Paving Co. of Dearborn, Mich., used mixed-in-transit concrete with great success. The expense of setting up a complete batching plant and equipment for handling the aggregate and mixed concrete more than offset the slightly higher cost of purchasing the commercial product delivered to the job.

The culvert was located near the westerly end of the job not far from Telegraph Road, Detroit. The culvert measured 265 feet 10½ inches long, 24-foot span, and 8-foot 6-inch spring height. The walls were 4 feet 6 inches from the bottom of the footings to the spring line. The section of the culvert, which is a skew affair, is circular at 45 degrees and approaches a parabola at right angles to the center line. The walls are 6 feet thick at the base, 2 feet thick at the spring line and 1 foot thick at the top of the arch. The footings are 8 feet wide and 2 feet 3 inches thick.

The site was excavated with a Northwest crane and ¾-yard Williams clamshell bucket which were later used for the backfill. The soil was a firm clay which excavated well and was suitable for the use of mud sills to support the form centers.

Unusual Form Work Handled Well

To support the forms proper the contractor carried nine sets of stringers, two against the wall about 3 feet 6 inches above the footing, and three on either side of the center stringer. The culvert was poured in six sections but the forms could not be used over as much as was desired as they had to remain in place too long in order to insure the safety of the culvert arch. It was necessary to use four complete sets of stringers in the six sections as four of the sections were poured before any were stripped.

The mud sills were 3 x 12-inch lumber run at right angles to the center line of the culvert with other 3 x 12's run longitudinally on top of the first set. As proof of the stability of the mud sills on this particular job there was no settlement in four pours of concrete. On the mud sills were erected 6 x 8-inch uprights supporting the 6 x 8-inch stringers. Joists of 2 x 19-inch lumber were skewed over the stringers to approximate the form of the barrel arch and then 4 x 4-inch lumber spaced about 2 feet on centers was run longitudinally and wedged to give the proper contour for the arch. Over this was nailed the 1 x 8-inch planed shiplap lumber in 12 to 18-foot lengths at right angles to the center line of the culvert. This gave a very smooth curve to the arch with a complete absence of flat spots.

As insurance against settlement in the forms during pouring, the uprights were held in position by pairs of hard wood wedges.

REINFORCING

The walls and arch of the culvert were heavily reinforced with ½ and ¾-inch steel, the latter running parallel to the center line of the culvert and the former with the angle of the skew. The reinforcing was placed at both the top and bottom of the slab and connected with stirrups of ¼-inch reinforcing steel. All reinforcing was carefully tied, using automatic wire twisters.

POURING THE WALLS AND ARCH

A fleet of nine Rex mixer trucks hauled the 2½-yard batches of aggregate and cement a distance of 20 miles from the center of Detroit to the site of the job. Mixing was started about 20 minutes before the arrival of the trucks ready to pour. The run from the plant to the job required about one hour in the morning but about one hour and fifteen or twenty minutes in the afternoon, due to the increasing amount of traffic as the day progressed. After the contractor had set up his own batching plant for the paving of the highway the fleet of mixer trucks was reduced to three and the batches loaded at the road plant about one-half mile from the culvert. The mixer trucks were all mounted on International chassis.

The mixer trucks were run onto the edge of the fill adjacent to the culvert and chuted the concrete to a 1¼-yard bottom-dump concrete bucket handled by a Bucyrus-Erie crane with a 40-foot boom. With the mixer trucks it required about 6½ to 7 hours to pour one 44-foot section of the culvert. The forms were left in place 14 days before stripping.

The quantities of concrete in the culvert structure amounted to a total of 1,378.7 cubic yards divided as follows: 536.0 yards of Grade B concrete, 1:2½:4 mix, for the spandrel walls and abutments; 467.3 cubic yards of Grade A concrete, 1:2:3½ mix, for the arch ring; and 375.4 cubic yards of Grade C concrete, 1:3:5 mix, for the footings. There were 66,651 pounds of steel reinforcing in the structure.

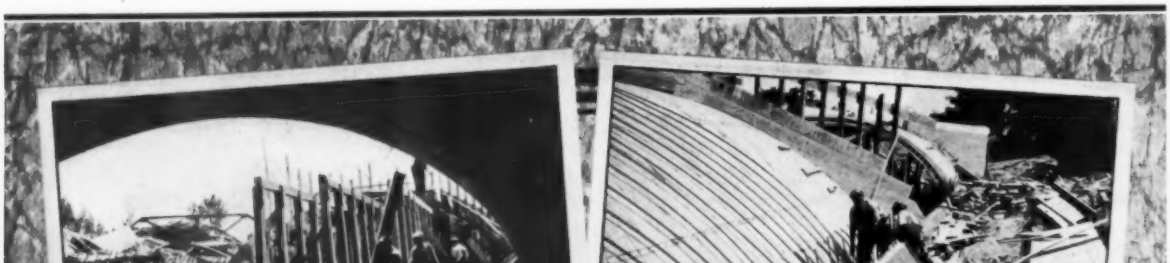
LABOR ORGANIZATION

On excavation there were only the crane operator and two hand laborers trimming up. On the form work there were from four to twelve carpenters and from six to twelve laborers. The laborers painted the top surface of the concrete arch with Truscon asphalt waterproofing and covered the construction joints with the waterproofing. Then a canvas saturated with the asphalt material was placed over them and a top coat of the cold asphaltic paint.

The backfill was carried 3 feet over the top of the arch and was all puddled as placed. All signs of honeycombed concrete in the arch were carefully hand finished and filled, the reinforcing rods cut back and the spandrel walls carefully rubbed to a smooth finish.

PERSONNEL

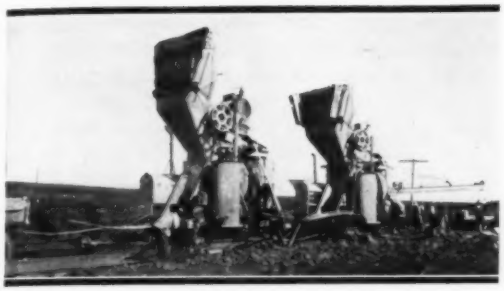
This culvert was built by the Smith Paving Co., of Dearborn, Michigan, Charles F. Smith, President and Lorin Coffman, Superintendent. For the Michigan Highway Department, H. J. Brighton was Project Engineer.



ACTION ON A FINE PIECE OF CULVERT CONSTRUCTION

1. Setting up the stringers on mud sills to support the forms for the barrel arch. 2. Wiring the bottom tier of bar reinforcement. 3. Hand finishing a section of the interior of the culvert after stripping the forms. 4. Backfill was handled with a crawler crane and clamshell bucket and was puddled continuously to insure the solidity of the fill.

Tandem Pavers— Triple Bridge— Double Pipe Line



C. F. Lytle Construction Company Paved First Section with Single Paver and Completed 24.22-Mile Job at Atlantic, Iowa with Tandem Pavers

A CHANCE to compare the operation of single tandem pavers on the same job operated by the same organization was offered by the C. F. Lytle Construction Co. of Sioux City, Iowa, in its long paving project running north and south of Atlantic, Iowa. The first section from 7.2 miles north of Atlantic was paved running toward Atlantic with the single paver and with the batching plant at Lorah and Atlantic. The next section was paved running north, starting 5 miles south of Atlantic, with the same batching set-up. This section was paved with the tandem machines. The third section was a 5-mile strip south of the second section which was paved toward the town of Griswold, with the batcher plant at that town.

On the Atlantic location of the batching plant the aggregates were unloaded from the gondola cars by a Koehring crane with a 1¼-yard Williams bucket, using a 50-foot boom. Wooden bins were used with the Johnson batchers which were covered with screens made up of I-beams with rods run through in two directions to form a mesh to catch the rags and wood dropped by the bucket with the sand and stone. A crew of two men in the cars, a craneman, and a batcher man handled the unloading and batching of between 18 and 20 cars a day. These were loaded into a fleet of one-batch dual pneumatic trucks which included a maximum of 75 International, Ford and Chevrolet trucks. The fleet was reduced as the hauling became shorter.

Handling the Cement

The cement dock located close to the batching plant consisted of a dock 65 x 10 feet which was ample to provide for the unloading of two cars of cement at a time. The unloading and batching of the cement was done by contract at a rate agreed per barrel. Six or seven men were used on the cement dock with usually three per car but when a new car was being opened only two could be used until the door was shoveled clear. The Fairbanks scales were well located and boxed completely to protect them from the wind and as far as possible from the cement. The dumping trap was well-built of 3 x 6-inch beams which were swung from the edge of the platform and the part extending under the platform used to counterbalance the trap proper and to support the trap when it was swung down onto the truck to dump the carts. A rope was attached to the trap solely to pull the trap up when the cement had been dumped. The section of the trap into which the carts ran was made up of 1 x 8-inch planks with two laid on top to act as tracks. The inside of the trap was lined with sheet metal to prevent, as far as possible, the sticking of the cement to the trap. Canvas slightly constricted where it went into the truck body was used to prevent scattering of the cement when it was dumped through the trap onto the batch.

The batches as weighed out at the plant for hauling to the road consisted of 1,843 pounds of limestone, 1,410 pounds of sand, and 575 pounds of cement. As the truck approached the cement dock a man stepped aboard and shoveled the sand to the tail-gate to cover it and prevent any leakage of the cement. Then when the truck had received its cement another man shoveled the sand over the cement and the whole was covered with a roll of canvas by the truck driver.

Fine Grade—Form Setting—Final Grade

Considerable care was taken to prepare the grade well in advance of the setting of the forms so that the grade might be kept clear of the grading machines as fas as possible and not interfere with the continuous stream of trucks which were running up to the paver and away as fast as they could be dumped. An Adams

elevating grader pulled by a Caterpillar Sixty tractor was used to core out the grade and deliver the earth to one side. The grade was then trimmed with an Adams 12-foot grader pulled by the same tractor. By this method the grade was left in a very good condition for the hauling fleet and there was not much to be done to it when the final grade was cut. A Ted Carr Form-grader cut the form trench true to line and grade from the stakes.

Eight men did the hand work on the form trench and handled the setting of the 10-inch Metaforms. Three teams on the shoulders plowed the earth for cover and also brought up the forms from the rear and spotted them along the edge of the grade ready for the setters. A Galion power grader cut the thickened edge from the 10-inch thickness at the forms to the 7-inch thickness at a point 4 feet from the forms. Two Caterpillar 2-ton tractors with fresnos removed the excess dirt from the grade following the power grader. The grade was well-compacted with a 5-ton Austin Bull Pup roller ahead of the Blaw-Knox turntable. Two men tamped and lined up the forms on either side ahead of the paver but close enough to be sure that no trucks would knock them out of line. The man who oiled the forms also cleaned the lip curb forms as they were spotted along the shoulder on one or both sides, depending whether it was a super-elevated curve or a grade, respectively.

RUNNING IN TANDEM

Dumping a truck every thirty seconds for twelve hours may be some one's idea of fun but let him take the job with tandem pavers which are running on schedule and there will be a howl if there is one batch missed in the course of the day. With the investment in the extra machine and the added labor organization, the contractor cannot afford to lose a single batch, so the dump man is as busy as the tower man near a railroad terminal during commuting hours. Paver No. 1 of the Rex 27-E twins pushed a Carr subgrade template to cut the grade to within ⅛-inch of the final grade. Two men shoveled the dirt to the shoulder and watched for low spots to be filled as the paver pushed ahead. In spite of a rather effective chute between the two pavers there was some spilling of grout at the end of the delivery of each batch from No. 1 paver to the skip of No. 2 paver, which did not exceed over 8 cubic feet in a day's run. The skip of No. 2 paver was held about 30 inches above the grade and clear of the I-beam tie bar between the two pavers by a cradle of heavy timbers. This was carried up on each lift of the skip. The specified one-minute mix was divided into two equal parts of 30 seconds in each paver.

A second subgrade planer was pulled by the second paver and two men watched the accumulation of earth in front of it. The excess was shoveled out as fast as it gathered. Six rolls of 38-inch tar paper were spread over the grade running longitudinally, this work being done by the two steel men. At each move of the paver the paper was unrolled making a continuous waterproof layer between the fresh concrete and the grade to insure that the concrete would have the full benefit of the mixing water rather than have it absorbed by the grade. As the paper was spread the puddlers cast concrete on it to prevent its blowing out of position in the strong breezes for which the Mid West is well-known.

The two steel men used a piece of reinforcing rod bent to give a slight loop at either end, 3 feet apart, for correctly spacing the 11-foot transverse bars which were set alternately 6 inches from one form and then 6 inches from the other. They were tied to the longitudinal bars at the sides and at the center and supported by removable supports between, which were pulled out as the concrete was poured and thus supported the bars in place. At the sides the longitudinal bars, ⅝-inch diameter, were supported by steel chairs at the expansion joints and by removable bar supports along the forms as the concrete was poured. One man working along the shoulder made up the expansion joints in a setting machine with the caps and the dowels in place ready to be set at 60-foot intervals. The dowels had steel sleeves on the side toward the new concrete and the pieces of Elastite expansion joint were wired into the setting machine. The handle for placing and removing the joint device was a single piece of pipe at each end. The expansion joint material was carried on No. 1 paver and the transverse bars on paver No. 2 under the operators' platforms.

There were two puddlers, and two spaders and one operator for the single Ord finishing machine. This crew every day spread and finished the 1,800 feet of concrete poured by the pair of pavers. They worked a full 12-hour day.

THE TRIPLE BRIDGE

The longitudinal float men who also handled the setting of the center strip of the longitudinal dummy joint were provided with a triple bridge. It was really a well-built double rolling bridge with an extension to provide means for setting the dummy joint. The main bridge made up by the contractor was mounted on four wheels and was built with a 3-inch channel iron on either edge of the 2 x 12-inch planks running across from one form to the other. The ends running along the forms were made of 6-inch channels with 8-inch plates to attach firmly the 3 and 6-inch channels. The extension in front was merely made up of 3-inch channels securely bolted.

A well-padded 2 x 12-inch plank was set just one side of the middle from the end of the triple bridge to the forward section of the main bridge and from this one man, with the help of one of the longitudinal float men, inserted the longitudinal center strip with a well constructed machine. The inserting machine was carried in a frame at one side of the front section of the triple bridge. The strip, carried on the bridge, was placed in the machine and then the two men took it to the center and placed the strip in the slot cut by the wheel on the Ord finishing machine which was let down into the fresh concrete on the second pass of the finishing machine. The second longitudinal float man hand-floated over the strip prior to using the 12-foot longitudinal float across the entire slab.

Four finishers were used, two on the drag straightedge, and two floating with the 5-foot floats. They then went back and pulled the two canvas belts across the concrete with the checking straight-edge used between them. When running lip curb the regular 3-inch Metaform steel lip curb forms were used and three men were used on each side to set the forms, make the curb

and to carry the empty trays forward. Half oil drums were used for trays for the concrete for the curbs and they were covered with burlap to prevent premature drying out of the concrete in the tray.

Two 2-Inch Pipe Lines for Water

The contractor found it more economical in the long run to use two 2-inch pipe lines instead of one 3-inch line. One of the lines was used for the paver and the other for the sprinkling. The contractor had figured that it is harder to make repairs and rethread a 3-inch pipe than it is a 2-inch pipe and the cost of handling the 2-inch pipe is much less even for a larger linear footage of the pipe than for the larger diameter.

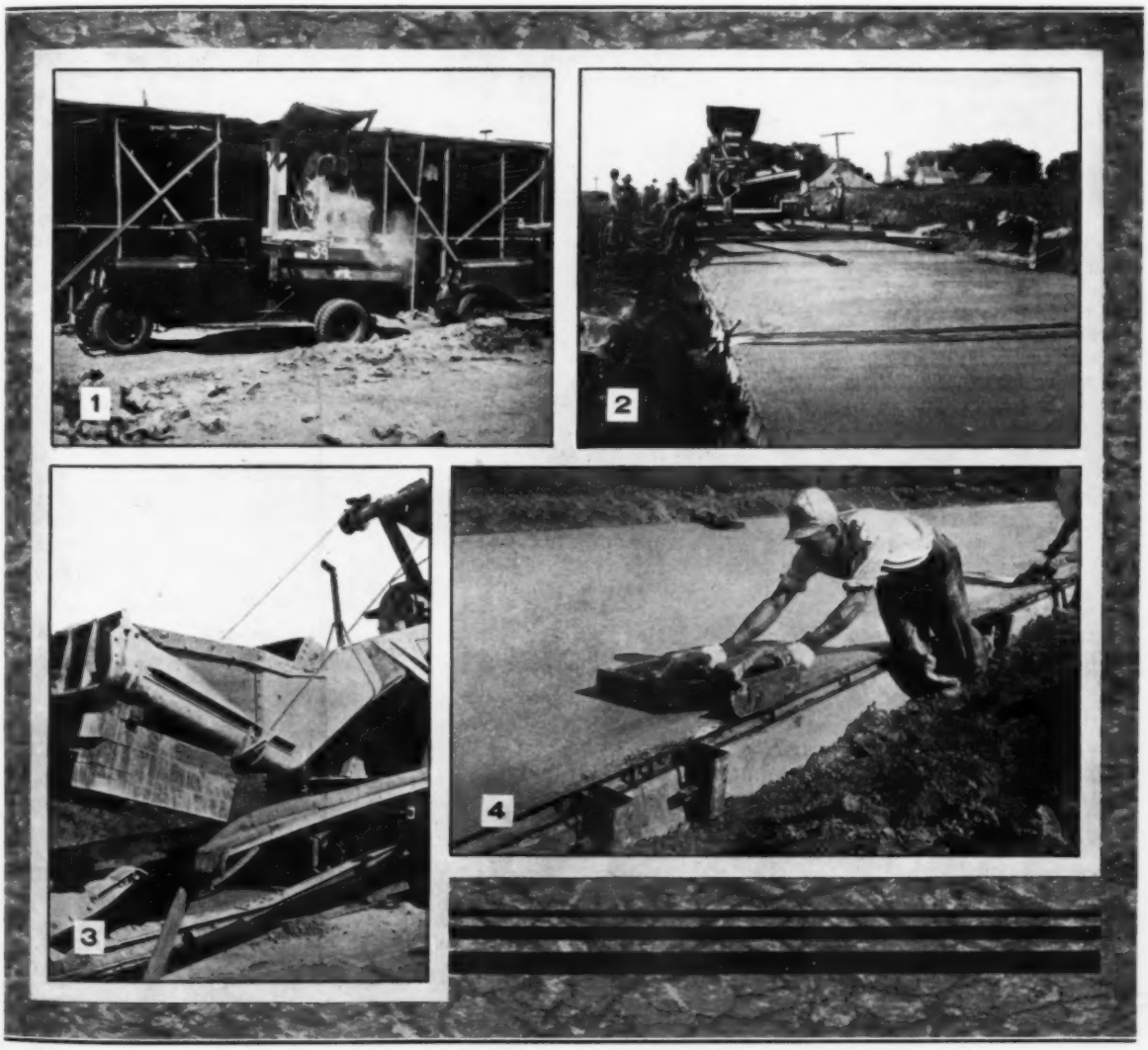
One Novo triplex and three Rex triplex pumps were used on the water supply. The taps for the paver hose were set at intervals of 265 feet with the same spacing for the sprinkling hose taps. The pavers carried 150 feet of 1½-inch hose with a cross connection for water for No. 2 paver when needed for washing out. No water was added to the batch in the second paver. One-inch sprinkling hose was used throughout the job.

Fourteen men handled the covering of the slab after the one-day curing with the burlap cover. These men also pulled the forms and sent them forward by the three teams run for that purpose.

One man back of the finishers working from a single bridge without rollers removed the caps from the expansion joints and finished them.

Personnel

This job which was started April 24, 1931, and completed September 26 was handled in an expeditious manner by the C. F. Lytle Construction Co. of Sioux City, Iowa, with G. E. Wickland as Superintendent. C. F. Lytle is President and F. W. Parrott, Secretary of the company. C. H. Mattox was Resident Engineer for the Iowa State Highway Commission



OPERATIONS AND DETAILS ON A TANDEM PAVER JOB IN IOWA

1. Dumping a buggy of bulk cement from a hinged trap at the cement dock. 2. Hand floating the surface of the concrete slab. 3. Heavy wood blocks were bolted under the skip of No. 2 paver at either side to absorb the shock when the skip was dropped. Note the tripper arm at the left which controlled the chute of No. 1 paver. 4. Pushing the "Iron Mule" or float to uniformly finish the lip curb.

A Tractor and Bulldozer on the Levee Keep the Dump Level and the Runway in Shape. These Allis-Chalmers Tractors Are Owned by the Stevenson Co. Working Near Helena, Arkansas.

Levee Construction Speeds Equipment Depreciation

A FEW visits to the camps of levee contractors are enough to explain the reason for the expression, "graveyard of power machinery". Tractors and other equipment are operated 22 hours a day—two 11-hour shifts with only one hour off each shift for oiling and greasing. This includes Sundays and holidays straight through the year, the only exceptions being those periods of high water when seepage is excessive. The levee tractor puts in 500 to 600 hours of actual work per month, and up to 5,000 hours per year. This compares with 1,500 to 2,000 hours per year for the average road building tractor.

Since levees must be built on schedule, the tendency is to keep the equipment at work until it quits entirely, rather than to lay it up for minor repairs or a regular inspection. Every job must be completed within the season, otherwise the government engineers do not hesitate to call in outside help and this "force-account" work cuts into the profits. Hence the levee contractor demands equipment that will stand up day in and day out under the strain of grueling work, and with nothing more than minor servicing during the short rest periods.

Many of the levee outfits are completely tractorized with tractors pulling elevating graders and wagons. Others use a dragline or shovel in connection with the tractor-drawn crawler wagons. The 7 or 8-cubic yard capacity wagons may be loaded therefore with either elevating graders or draglines but in either event, heavy-duty, high-speed tractors move the dirt to the top of the levees. A typical tractorized outfit consists of four or five tractors with 7 or 8-yard crawler wagons. If an elevating grader is used to load the wagons, it is pulled by another tractor. Still another tractor, usually of smaller size, is equipped with a bulldozer to keep the runways on top of the levee in good condition. This operation not only permits the wagon tractors to haul larger loads without danger of miring down but also eliminates the need of running tractor-drawn wagons dangerously close to the edge of the dump.

Dirt hauling on a levee is heavier work than the ordinary dirt hauling job in road construction. The loaded wagons must be pulled upgrade over the soft dump to the top of the levee, whereas in road construction work the load is generally pulled down hill to the dump. Soil conditions are more of a problem. The vast network of levees goes through all types of country—sloughs, bayous, old lake-beds and forests. Soft, sticky blue clay is encountered. Then again there is buckshot, the levee man's nightmare. Buckshot consists of volcanic material washed down by the Missouri River from the Bad Lands of North Dakota. In dry weather it is hard but spongy. In wet weather it absorbs moisture and softens into a sticky, clinging mass with a tendency to slough and slide.

Under such conditions it is no wonder that levees have been the graveyard of power machinery. Yet the present levee jobs are ahead of schedule. It is reported that the 10-year plan which provided for a $325,000,000 appropriation, made in 1928, is already more than one-half completed. More than 235 miles of levee were built in 1931 under the supervision of the U. S. Engineer Corps and more than 95,000,000 yards of dirt went into these levees.

Load More Dirt

THERE are several factors affecting the operating cycle of a shovel, which can be divided into four consecutive actions: 1. Loading the dipper; 2. Swinging over the hauling unit; 3. Dumping the spoil; 4. Swinging back into position. Moving forward may be classed as a necessary interruption.

In ordinary excavation, 4 or more feet in depth, a 1-yard shovel should make at least two complete cycles per minute, providing the hauling equipment, such as trucks, wagons, etc., are so placed that the average swing does not exceed 90 degrees. The respective time allowances per cycle are: filling the dipper, 12 seconds; swinging to and spotting over the truck, 9 seconds; dumping, 2 seconds; returning to digging position, 7 seconds. The following hints, made by D. B. Patterson, Vice President, Harnischfeger Corp., Milwaukee, Wis., may help you to maintain this schedule.

Filling Dipper. Keep the dipper teeth sharp. Move forward frequently and clean up the floor, permitting the dirt to slide down into a loose heap.

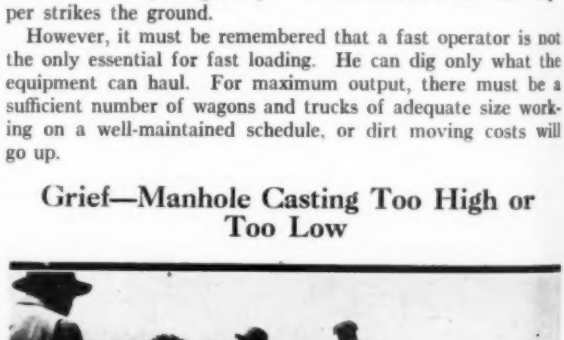
Swinging and Spotting. Hoist while swinging. Keep the hauling equipment close to the cut, thus avoiding a long swing. The difference in swinging 90 degrees compared with 180 degrees may cut the output 25 per cent. Do not swing too fast when approaching the wagon.

Dumping Spoil. When the dipper is nearing tripping position, take up the slack in the trip rope. Start swinging back as soon as the trip is released.

Swinging Back to Dig. Start lowering the dipper, and reverse the crowd, being ready to crowd forward when the dipper strikes the ground.

However, it must be remembered that a fast operator is not the only essential for fast loading. He can dig only what the equipment can haul. For maximum output, there must be a sufficient number of wagons and trucks of adequate size working on a well-maintained schedule, or dirt moving costs will go up.

Grief—Manhole Casting Too High or Too Low



ONE OF THE TRIALS OF CONCRETE PAVING IN CITY STREETS

This contractor finds the manhole casting is ¼-inch high and has to dig out the concrete and reset the casting

The Editor Comments—

Diversion of Gas Tax Money Not Necessary

There is such a general movement on foot for the diversion of the money collected through the gasoline tax in the various states for use for other purposes that it was encouraging to visit one state which has stuck by its guns and is devoting its gas tax money to roads and has found a new tax to make up the state deficit. Mississippi, which needs every cent of money possible to improve her gravel roads, found that income from regular tax sources was sadly reduced and hence considered raising the gas tax and appropriating the extra funds for purposes unrelated to roads. It also considered establishing a general sales tax. Governor Conner and the Mississippi legislature, in spite of determined opposition, had the temerity to break precedent and on May 1 the sales tax of 2 per cent on nearly all commodities went into effect. The returns for its first four months indicate that the tax will bring in a half million dollars a year more than the estimated $2,000,000.

So far there has been no evidence that Mississippians have increased their out-of-state buying. Trade has gone along as usual. Retailer bankruptcies have not increased. The cost of collection is insignificant. Mississippi merely added a dozen men to the staff already collecting levies on tobacco, malt and so on.

Early opponents of the general sales tax now admit that it is a completely satisfactory method of meeting the emergency; that the tax is equitable which gas tax diversion could never be. In the raising of emergency funds Mississippians share in proportion to their spending. A dozen other states, as well as the Federal government, according to an Associated Press dispatch, are considering the adoption of the general sales tax. It is hoped and expected that the general sales tax will be accepted in preference to diverting road funds away from roads. The large employment of labor which road work entails both on the project proper and in the production of the material used in their construction demands undiminished financing by Federal, State and County governmental units.

Trap Rock

The derivation of common terms used for construction materials provides an interesting study. A short time ago the superintendent on a project asked us where the word "trap" came from as applied to the fine grained igneous rock which is used as a concrete aggregate so generally in the northeast section of this country. A search of geology text books, encyclopedias and the office dictionary brought forth the information that trap rock is a common name for basalt but gave us no hint of the origin of the name. Inquiries were addressed to quarry owners but without result. Of one thing we were sure, it was not named for Walter Traprock for in this case the tree came before the nut.

Finally we secured from the Chief of the Science and Technology Division of the New York Public Library the following very interesting information which we are pleased to pass on to our readers.

The word "trap-rock" does not appear in the indexes of half a dozen modern mineralogies which we have consulted. From the Century Dictionary (1895 edition) we find the following:

" 'Trap (-G *trapp*, Dan. *trap*, Sw. *trapp*, trap (rock), so called (by Bergmann, a Swedish mineralogist) with reference to the terraces of stair-like arrangement which may be observed in many of these rocks, *trappa*, a stair. . . . The term "trap" is an indefinite, and therefore sometimes a very convenient, term applied to eruptive rocks which cannot be identified in the field.' "

Gentlemen—May We Again Present the Hyper-Technical Inspector

During our trip this summer we ran into another case of an inspector who expected the contractor to manicure the grade before any concrete was placed. We agree with every state highway specification which requires a firm grade true to crown. So far so good. On the particular job I have in mind, the grade was admittedly perfect and looked like a finished concrete slab.

It happened a few days before that a sudden thunder shower arose which was not severe enough to shut down the job, but in the well manicured grade it did leave typical rain drop "pock marks." The inspector feared that this might result in an uneven bearing of the concrete on the grade so he required that the contractor refinish the grade, topping it with new material which had to be immediately scraped off under the template.

How much strength did this performance, which delayed the work for 15 or 20 minutes, add to the concrete and how many years did it add to the life of the pavement?

Congratulations, Pennsylvania!

The good news comes to us in an editorial from the *Highway Builder* that the Pennsylvania legislature, in the second special session of 1932, voted not to divert the gas and motor license taxes but instead has joined Mississippi in levying a sales tax. In its editorial our contemporary says, "It is hoped that their (Pennsylvania and Mississippi) stand against diversion, at least may serve as a rallying call for the opponents of diversion everywhere and greatly strengthen their efforts throughout the nation."

Theodore Reed Kendall

Who's Who in Construction

A Series of Reports from Active Contractors

BUS. VOLUME—ANNUAL VOLUME OF CONTRACTS
A—Over $5,000,000 .
B—Between $1,000,000 and $5,000,000
C—Between $500,000 and $1,000,000
D—Between $250,000 and $500,000
E—Under $250,000

Baxter Building Co., Cincinnati, Ohio, 750 Avon Fields. Organized: 1911. Bus. vol. E. This business was started about 1840 and has been active since then. It has always been under the ownership and direction of father and son, no outsiders ever having been taken in. They have been interested primarily in fine residence construction, handling special buildings, such as commissaries and display buildings. Officers: W. H. Baxter, Manager, C. L. Baxter, Assistant Manager, C. W. Baxter, Secretary & Treasurer, John Baxter, Retired, Advisor. Major contracts: Multi-color type building on Eastern Ave., Cincinnati, and several residences.

Birmingham Boiler & Engineering Co., Birmingham, Ala., 815 N. 41st St. Organized: 1926. Bus. vol. E. Officers: W. N. Johnson, President and Treasurer; C. C. Pinckney, Vice President and Secretary. Major contracts: City blast furnace, Birmingham; lime kilns, Calern, Ala.

Union Bridge & Construction Co., Kansas City, Mo., 1205 Midland Bldg. Organized: 1906. Bus. vol. C. In 1906 this company was incorporated by four men, three of whom are deceased. The original capitol increased by stock dividends from $50,000 in 1906 to $100,000 in 1910. Officers: Clarence A. Neal, President; E. M. Philpot, Vice President; H. C. Beck, Secretary; O. W. Anscheutz, Chief Engineer. Major contracts: 1927, substructures for Mississippi River Bridge near St. Louis, Mo.; 1928, substructures for the Ohio River Bridge near Paducah, Ky.; 1929, Canadian River Bridge for the Santa Fe Railroad; 1930, Illinois River Bridge for the Santa Fe Railroad; 1931, Canadian River bridge for the Santa Fe Railroad near Amarillo, Texas, the White River bridge for the Arkansas Highway Department, two Tennessee River bridges for the Kentucky Highway Department.

E. Clifford Durell, Philadelphia, Pa., 1711-13 No. 24th St. Organized: 1905. Bus. vol. D. This business has been the same since its start, no incorporations or partnerships having been incurred at any time. Member: Master Builders Exchange, N. E. Philadelphia Chamber of Commerce, Master Carpenters & Builders Association.

C. W. Schmidt, Baltimore, Md., 226 Hearst Tower Bldg. Organized: 1924. Bus. vol. E. This company was organized as an individual concern executing general building construction, chiefly industrial. Officers: Carl W. Schmidt, General Manager and Geo. Schmidt, Secretary. Major contracts: 1928, Crown Cork & Seal Co., Baltimore, Md., $117,000; 1928, State of Maryland Military Buildings, Pikesville, Md., $135,000, Shell Oil Company plant, Baltimore, Md., $65,000, School at Garrison, Md., $30,000; 1930, Warehouse for the Wm. E. Hooper Co., Baltimore, Md., $65,000. Member: Master Builders Association of Baltimore and Association of Commerce of Baltimore.

Feller Brothers, Rochester, Minn., 220½ First Avenue, S. W. Organized: 1923. Bus. vol. E. Officers: L. M. Feller and J. W. Feller. Major contracts: 1927, 5-deck girder span bridge, $50,000; 1928, 5-deck girder span bridge, $40,000, five bridges on 13-mile project, $40,000; 1929, 120-foot high steel truss, $24,000; 1930, three 45-foot span deck girder bridges, $34,000; 1931, 150-foot high steel truss, $23,000. Member: Northwest Bridge Contractors Association.

James Sherry, Havre, Montana, 626 3rd St. Organized: 1915. Bus. vol. E. Major contracts: 1928, contract in Havre, $43,000; 1929, contracts in Havre and Box Elder, Montana, $50,000; 1930, contracts in Havre and Browning, Montana, $51,000. Member: Montana State Contractors Association.

The Byerlyte Corp., Cleveland, Ohio, West 4th St. & B. & O. R. R. Organized: 1922. Bus. vol. C. This company was organized in 1922 succeeding Byerley & Sons, world's pioneer manufacturer of asphalt. It is engaged in the manufacture of special asphalts and compounds and built-up roofing and waterproofing materials. Officers: D. N. Myers, President; A. Broz, Assistant Secretary. Major contracts: Roofing and waterproofing in middle west, roofing and waterproofing of three Lakeside Hospital buildings at Cleveland, waterproofing for the New York Central Grain Elevator at Indiana Harbor, Ind., waterproofing of Cuyahoga Viaduct at the Cleveland Union Terminal, which is the country's longest railroad bridge, concreted, surfaced and waterproofed. Members: Builders Exchange, Chamber of Commerce of Cleveland, National Asphalt Institute and Asphalt Technologists.

E. W. Coons Co., Inc., Hibbing, Minn., 2007 Fourth Ave. Branch office: St. Petersburg, Fla. Organized: 1912. Officers: W. C. Cohoe, President; E. W. Coons, Vice President and Treasurer; O. W. Hallin, Secretary. Major contracts: 1928, St. Petersburg breakwater, $60,000, Hibbing paving and reservoir, $159,999; 1929, Hibbing paving, $259,000, iron ore washing plants, $30,000, concrete breakwater, $46,000; 1930, Hibbing paving, $150,000, Range paving, $295,000; 1930, iron ore washing plant, $25,000; 1931, State paving, $452,000.

C. A. Morrison & Son, Shelby, N. C. Organized: 1921. Bus. vol. E. Officers: C. A. Morrison, President; C. M. Morrison, Manager. Major contracts: 1928, High School in Shelby, residence in Shelby; 1929, Lawrence Hospital in Mooresville, N. C.; 1930, High School at Fort Mill, S. C., Lakeside School at Leakesville, N. C., Telephone office building, Lancaster, S. C.; 1931, Latham residence in Chester, S. C., High School in Shelby, N. C. Member: Carolina Branch of the Associated General Contractors of America.

Jos. M. Murray, Rochester, N. Y., 800 Cutler Building. Organized: 1924. Bus. vol. C. This concern is personally operated and supervised by Mr. Murray. His major contracts for the past 8 years have been New York State highway contracts.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Reading Between the Lines of Contractors' Agreements

Although a contract has been "put down in black and white," it does not follow that the rights of the parties are limited to the wording used. There may be a lot of important clauses forming parts of the agreement, which, like the unwritten Constitution of England, rests upon what has been regarded as *custom*. In short, the Law says that there where a contract is silent on a certain point either party is at liberty to show a general and well-known custom covering the point. On such showing the parties will be deemed to have silently agreed to be bound by that custom.

The Indiana Appellate Court dealt with a phase of this subject in the case of Denny v. Carpenter Construction Co., 168 N. E. 242. It was decided that a well-established custom between road contractors and bonding companies concerning the time when premiums on contractors' bonds should accrue fixed rights where the contracts for bonds did not show when the premiums should accrue.

But the decision leaves it clear that a custom is never admissible to contradict clear and explicit provisions, although always admissible to explain ambiguous clauses in a written contract, or, as above noted, to supply an implied agreement on a point as to which an express contract is silent.

When Uncompleted Structures Are Destroyed by Storm or Other Inevitable Accident

A contractor who undertakes a job is ordinarily presumed to take upon himself all risk of so-called "acts of God." If a a building is shaken down by an earthquake or blown down by a storm while in course of construction, it is up to the contractor to do all the work necessary to rebuild the destroyed structure, unless the contract safeguards him against such eventuality. But he is entitled to recover matured installments of the contract price.

This subject was dealt with by the Florida Supreme Court in an opinion filed September 11, 1930, in the case of Moon v. Wilson, 130 So. 25. The following is a summary of the most important points decided by the court:

The loss caused by the destruction by storm of a building partly finished falls upon the one who has undertaken to complete and deliver it to the owner for a stipulated price.

If payments are to be made in installments as the work progresses, an owner's obligation to pay such sums becomes fixed when the construction reaches the required stage, but not for intermediate work on installments not completed.

Where the contract provides for furnishing by the owner a part or all of the material or labor, upon destruction by storm or other unforeseen calamity, the loss may fall upon the owner.

Where the contract includes the repairing or remodeling of an old building and it is destroyed or damaged before completion, the liability for such portion may fall upon the owner, since the continued existence of the old building is an implied condition of the contract.

Some Aspects of Contracts for Material

"We will furnish all the base rock you need in constructing the 22nd St. Causeway," was in effect what one company said to another. But when suit for failure to deliver was brought the material company's attorneys contended that there was no binding agreement, because there was no definite agreement as to quantity of rock to be delivered.

In the case of Tampa Shipbuilding & Engineering Co. v General Construction Co., 43 Fed. 2d, 309, disposed of by the United States Circuit Court of Appeals, Fifth Circuit, September 27, 1930, it was decided that the quantity to be delivered was capable of definite ascertainment—by the purchasing company's needs in constructing the particular causeway. The court said: "A contract for one's needs for a particular enterprise is sufficiently definite, and is not unilateral."

In the same case the court said concerning the quality of rock to which the purchaser was entitled: "In a sale of a particular pile, it being at hand and capable of inspection, and not being the manufacture or product of the seller, there would be no implied warranty, but caveat emptor would apply. [In other words, the buyer would take the material 'as is.'] But, if unascertained rock were sold for a particular use known to the seller, he would be held to furnish rock suitable for that use."

Failing to Insure Compensation Risks

Mr. Contractor, if you do not carry a policy insuring your liability to pay workmen's compensation, and have not been officially exempted from the duty to carry such insurance, have you stopped to ask yourself, "Where would I stand if one of my employees were injured today?"

This qustion is not intended as a boost in behalf of insurance companies. It is suggested on reading a recent decision of the South Dakota Supreme Court, in which that tribunal ruled that where an employer remained inactive under the local compensation act—neither giving notice of a choice not to be governed by the law nor insuring payment of awards that might be made against him under the act—he automatically rendered himself liable to any ordinary action for damages at the instance of any employee who might become injured through the employer's fault. (Stevenson v. Douros, 235 N. W. 707). The court decided that, under the wording of the South Dakota law, employers who fail to carry such insurance cannot defeat such actions on the ground that carelessness of the injured worker contributed to the accident, nor on the ground that the injury was caused by carelessness of a fellow servant, nor on the ground that the injured man had such knowledge concerning the probability of his being injured in the way he was injured as to show a voluntary assumption of the risk. But the injured employee must prove negligence attributable to the employer.

No doubt, there are other states in which the courts would reach similar conclusions, because of similar wording of compensation acts. And in any state an employer will probably find himself at possible disadvantage in failing to comply with a local statutory requirement for carrying compensation insurance.

Construction Industry News

Monarch Manufacturing Co., Inc., Wilmington, Dela., has recently acquired the property, plant and equipment formerly owned and operated by Remington Machine Co., Wilmington, Dela., and is now in a position to do any class of light or heavy machine work. This company also manufactures a line of rock crushing and sand and gravel equipment, as well as snow plows and chip spreaders. Earle S. Philips is head of the executive and sales departments and associated with him are J. W. Kitts, John M. Bishop, P. D. Frack, F. H. Greaney, F. J. Pratt and G. W. Kerr. Harry E. Kind is in charge of the factory and engineering departments and associated with him are L. M. Brooks and several others formerly with the Good Roads Machinery Co.

American Waterproofing Corp., Brooklyn, N. Y., has announced that its product, Ampruf Process No. 7, for curing concrete has just been approved for all concrete road construction throughout the State of New York under the direction of the Department of Public Works and Division of Engineering.

Shell Eastern Petroleum Products, Inc., 122 E. 42nd St., New York City, has announced the tenth Colas factory to be completed under the license of Colas Roads, Inc. The new factory is located at Boston, Mass., and will assist the existing factory at Rutherford, N. J., in supplying the requirements of New England.

The Rawlplug Co., Inc., New York City, has announced the appointment of The C. K. Cairns Co., 119 E. 5th St., Cincinnati, Ohio, as its representative in a district including southern Indiana, central and northern Kentucky, western West Virginia and central and southwestern Ohio.

Allis-Chalmers Manufacturing Co., Tractor Division, Milwaukee, Wis., courteously furnished the photograph of levee construction which is reproduced on the front cover of this issue of CONTRACTORS AND ENGINEERS MONTHLY, showing a typical tractor and crawler wagon outfit being loaded by a dragline. The contractor's greasing station is shown at the right and his tent camp at the left.

A New 40-Horsepower Crawler Tractor

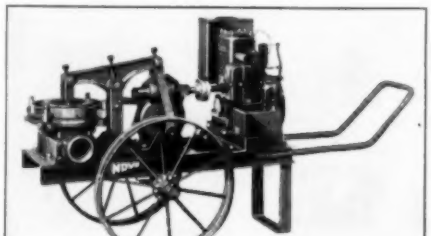
A NEW crawler tractor which develops a maximum drawbar horsepower of 40 and a maximum engine horsepower of 52 has been announced by the International Harvester Co., 606 So. Michigan Ave., Chicago, Ill., in its Model T-40 6-cylinder TracTracTor. This unit is suited for heavy construction such as road, dam, levee, irrigation and oil-field work, logging, etc., and particularly for the operation of bulldozers, backfillers, shovels and snowplows and pulling crawler wagons, scrapers and graders.

Accessibility is a feature of the new T-40 as steering clutches, transmission and brakes may be easily inspected, adjusted or removed through the top and rear cover plates without disturbing the track, track frame or driving sprocket. The large positive-acting plate steering clutches, a new crawler-tractor feature, are in the rear compartment of the main frame. The steering brakes are immediately to the rear of the clutches. Efficiency of operation is enhanced by the use of forty-four ball bearings. The 6-cylinder engine is of valve-in-head design and has removable cylinders of 3⅝-inch bore and 4½-inch stroke. There is a saddle-type-mounted heavy transverse spring which carries the front weight of the tractor. Independent angle braces keep the tracks in true alignment and also permit free oscillation of each track to conform to ground conditions.

The overall length of the new T-40 is 141 inches; overall width, 61¾ inches; height over air cleaner top, 65½ inches; drawbar height, high, 17 11/16 inches; drawbar height, low, 11 inches; tread width 47¾ inches; track shoe width, 16 inches; and length of ground contact, 70½ inches. The fuel tank capacity is 45 gallons and the approximate weight, 10,600 pounds. The tractor operates at the five forward speeds of 1¾, 2¼, 2¾, 3¼ and 4 miles an hour and at 2¼ miles reverse.

A Single-Force-Diaphragm Pump on 2-Wheel Truck

A FORCE-DIAPHRAGM pump rated in strict accordance with the standards of the Pump Manufacturers Bureau at 4,000 gph at a 10-foot static lift and with a guaranteed capacity 10 per cent greater has been announced by the Novo Engine Co., 216 Porter St., Lansing, Mich. This No. 3 Novo pump is mounted on a channel iron base with steel wheels and a pipe handle for ready movement by one man. By merely removing four bolts from the clamping ring, the diaphragm and valves are at hand and it requires only three minutes to change to a new diaphragm.



A New Single-Force Diaphragm Pump with Two-Wheel Mounting

The power unit is a 2-horsepower one-cylinder engine. The pump has a 3-inch suction and discharge. The gearing is all enclosed and the pump can operate against a total head of 50 feet. The overall dimensions of the truck-mounted unit are 60¼ inches long, 31¼ inches wide and 36 inches high with a total weight of 485 pounds.

A General Utility Dragline Bucket

A GENERAL utility bucket for the average run of dragline work built in sizes from ½ to 8 cubic yards full measure has been announced by the Bucyrus-Erie Co., South Milwaukee, Wis. In this Red Arch Type X dragline bucket special attention has been given to the design and selection of materials which will give strength and wear with elimination of dead weight. It features the Red Arch, a one-piece annealed steel casting providing strength without excess weight; a strong, smooth, manganese steel lip with low-cost renewable manganese steel teeth; tooth bases cast into the lip; teeth secured with simple wedges; and inexpensive, easily replaced runners and wearing plates protecting the bottom of the bucket. Operation in the field has shown that the new bucket fulfills the manufacturer's claim for ready digging, quick filling, easy carrying and free dumping.

The Fuller-Kinyon Type F Cement Pump Unloading Bulk Cement from a Hopper-Bottom Railroad Car

Unloading Cement from Hopper-Bottom and Tank Cars

WITH the increasing use of hopper-bottom and tank cars for handling bulk cement on construction projects, the Fuller Co., Catasauqua, Penna., has developed the Type F Fuller-Kinyon pump which makes this pneumatic system of handling cement available to contractors whose jobs are too small to amortize the cost of the standard portable pump. This pump may be used as a substitute for mechanical conveyors or conveying from standard box cars in which installations the pump would be located alongside the track and the cement delivered to the hopper either by power scrapers or shoveling. Further this conveyor can be easily driven by a gasoline engine on jobs where electric current is not available.

The Type F pump is designed to operate at pressures of air from 10 to 20 pounds for average installations. A number of the mechanical features of the well-known Fuller-Kinyon portable pump are incorporated, including a permanent aligned screw shaft bearing assembly. A novel externally adjustable seal is provided which can be changed by unskilled labor to take advantage of the best operating conditions. The usual installation of the Type F pump is to locate it in a shallow pit below the rail and the hopper is provided with an extension. Canvas spouting with steel flanges connect the hopper extension with the flanges of the car hoppers. For use in highway construction and other temporary installations, the pump and the motor or gasoline engine used for driving it are furnished with a fabricated steel sub-base, which is easily adapted to new plant locations.

New Standardized Line of Diesels

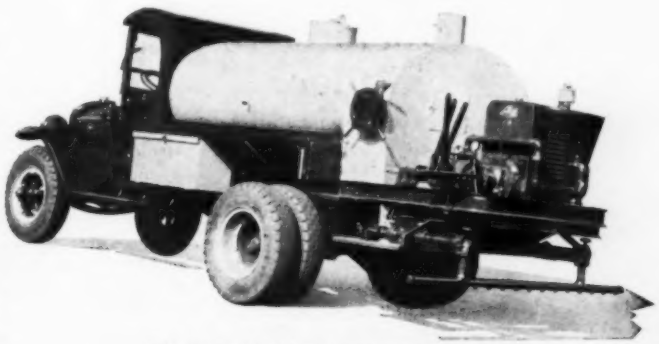
COVERING power requirements from 50 to 1,000 horsepower, in 2 to 8-cylinder units, an improved line of 4-cycle direct injection moderate speed diesel engines for stationary and marine services has been announced by the Worthington Pump & Machinery Corp., Harrison, N. J. Among the features of construction of these diesels are individual fuel pumps for each cylinder with fuel lines of equal length and hydraulic control of fuel injection. Individual air starting pilot valves control the admission of starting air to each cylinder and the spray valves are pressure actuated, no push rods or levers being used.

The lubricating oil is circulated through a cast-in main duct in the base with cast-in branches leading to the bottom of each main bearing by an attached pump. These diesels can easily be converted to operation on manufactured or natural gas, the same base, frame, crankshaft and connecting rod being used for both engines. When running on gas, a magneto and spark plugs replace the fuel pumps and spray valves, a mixing valve is bolted to the end of the regular inlet manifold, and gas engine cylinders with larger valves in the heads, are substituted.

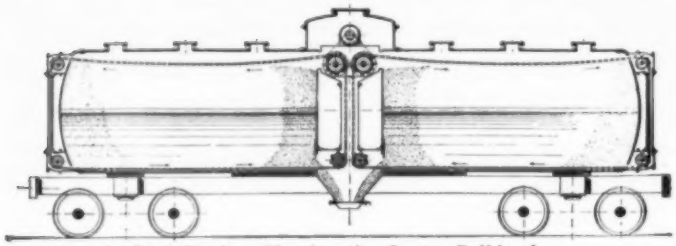
A New Truck-Mounted Asphalt Pressure Distributor

THE new Littleford pressure distributor available in 500, 600, 800, 1,000, 1,200 and 1,500-gallon capacities for mounting on any suitable truck, trailer or semi-trailer, being adjustable to the chassis, has recently been announced by Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio. A feature of the distributor is the patented six-way valve which is controlled from the hand-wheel and is plainly marked: Fill, Circulate, Spray and Drain. At each point of operation, the hand-wheel sets so that the operator knows positively that the valve is in the proper position. A Viking rotary pump handles the bitumen to and from the control valve. This pump is driven by a 4-cylinder, 4-cycle engine fitted with an oil-type air cleaner and a variable speed governor control. At governor setting No. 1 the pump is driven at a speed to deliver 150 gallons of bitumen per minute. At setting No. 2, 200 gallons, and at setting No. 3, 250 gallons. The heating unit consists of a low pressure coilless oil burner, a fuel pump, 40-gallon fuel tank and a ball-bearing blower operated from the distributor engine. The burner which uses grades 1, 2 or 3 fuel oil requires no preheating. The flame from the burner passes through a cast iron combustion tube which extends into the heat flue. No flame comes in direct contact with the flue, therefore it cannot burn out. Heat passes through the main flue and three times through each of the smaller flues before it is exhausted into the heat chamber. The combination of low pressure burner and continuous heat flue makes it possible to raise the temperature of heavy penetration types of bitumen 5 degrees Fahrenheit per minute.

The heat chamber encloses the pump, valve and manifold lines. Heat from the burner can, by means of a flame deflector, be cut away from the heat flue so that all heat passes into the heat chamber instead of being circulated through the tank. This is done so that the operator may thaw out the pump and control valve to assure quick starting.



The New Littleford Pressure Distributor



A Longitudinal Section, Showing the Center Bulkheads, Drive Unit and Operation of the Drag Chain Conveyors, of the Dry-Flo Tank Car

A Self Unloading Tank Car for Bulk Cement

A TANK car especially built for handling dry granular material and particularly adapted to the shipment of bulk cement has been developed by the General American Tank Car Corp., in conjunction with Link-Belt Co., 910 So. Michigan Ave., Chicago, Ill. In outward appearance the Dry-Flo car is very much like a tank car except that it has six openings for loading from the top instead of one. It unloads automatically through a single opening in the bottom which lends itself to simple conveying means to carry the material from the car.

Inside, the tank car is divided into three compartments, two large compartments which carry the lading, while a small one houses the machinery by which it is unloaded. The unloading mechanism consists of Link-Belt power-driven drag chain conveyors which are pulled along toward the center outlet by means of sprockets located in the center compartment. The conveyors are driven by a motor located in the dome, or by external power applied by a shaft provided for that purpose. A gear speed reducer makes it possible to operate the conveyor chains very slowly. Provision is made for throwing out power on one end of the car, should it be desired to unload it at a lower rate of speed, and also for starting one end at a time, should the lading be unduly packed. To operate the unloading equipment, it is necessary only to open a valve at the bottom of the car and connect up the motor to a source of electric power by means of a flexible cable. The car may generally be unloaded in less than two hours, varying slightly according to the commodity. This provides a discharge rate of about 400 cubic feet per hour using one chain, or 800 cubic feet per hour using both chains. Discharge is arranged to empty the car completely. Cement has been loaded with 65 tons to the car in 30 minutes and unloaded in less than two hours. Where the Dry-Flo car is substituted for sack shipment of cement, it is reported that the saving of packages and labor has been as great as $2.00 per ton or $130.00 per carload per trip, and the difficulties from arching, so common in bins where cement is stored, have been entirely overcome.

An Air-Operated Shank Grinder

THE ends of drill steel shanks must be flat and square with the axis of the shank or else trouble will be experienced with the breakage of the drill piston and a shortening of fatigue life of the drill steel. Ingersoll-Rand Co., 11 Broadway, New York, N. Y., has announced the I-R 4K shank grinder for truing the ends of drill steel shanks, rock drill pistons and anvil blocks. The grinder consists essentially of an I-R multi-vane grinder so mounted in a frame as to allow the grinding wheel to be passed back and forth by means of a handle. The grinder mounting is equipped with a wing nut adjustment working under tension that allows the grinder to be fed up against the face or end of the drill shank or piston being ground. A self-centering V block clamp is incorporated in the frame for rigid clamping and aligning of the piece to be ground. A countersinking bit is located in the center of the wheel hub for removing the burr from the hole in hollow drill steel. It is particularly helpful in preventing damage to the water tube when drills are used wet. The frame is provided with a flat base with bolt holes so that the grinder can be bolted rigidly on top of a work bench.

A Line of Heavy-Duty Power Units in the Low Horsepower Range

THE new IX series of heavy-duty 4-cylinder power units recently announced by the Hercules Motors Corp., Canton, Ohio, makes available Hercules power units in a complete range of sizes from 6 to 175 horsepower. This new series contains three models known as the IX, the IXA and the IXB, all having the same overall dimensions and hence being interchangeable in connection with any assembly, the only difference in specifications being in the bore of the engines and the parts affected thereby.

Model IX has a 2½-inch bore, a 4-inch stroke with horsepower range from 4 at 400 rpm to 27.5 at 3,200 rpm. Model IXA has a 3-inch bore, 4-inch stroke and a horsepower range from 5 at 400 rpm to 39.5 at 3,200 rpm. Model IXB has a 3¼-inch stroke and a horsepower range from 6 at 400 rpm to 46.5 at 3,200 rpm.

Present day operating conditions often demand sustained high speed and therefore special attention has been given to valve cooling. The cylinder walls are water jacketed not only around the combustion chamber but full length, allowing the oil splash to come in contact with water cooled cylinder walls when the piston is at top stroke. The crankcase and cylinder block are cast integrally, there are ample bearings and forced oil feed to all main bearings and connecting rods and a self-priming oil pump. These units are completely housed in heavy gage sheet metal and side panels, with the supports and mounting of rugged design to eliminate vibration and withstand severe service.

The engines in these units are of the L-head type with 30-degree valve seats. The exhaust valve is a one-piece forging of silcrome steel and the port has a clear diameter of 1⅛ inches. The intake valve is a one piece forging of chrome nickel steel, and the port has a clear opening of 1¼ inches. The valves are operated by mushroom type tappets of steel with cast iron face. These units can also readily be equipped to operate on natural gas or kerosene as fuel.

One of the New Hercules IX Power Units

A complete line of take-offs are available in connection with this series including clutch power take-offs, solid power take-offs, reduction gears of various ratios with or without clutch, right angle drive take-offs, vertical drive take-offs with or without reduction gearings as well as reverse gear drives, straight or with reduction transmissions and stub shafts.

Flexibility in a 1-Yard Power Shovel

CONTRACTORS are called upon for such a diversity of work even on a single contract that it is necessary to give consideration to the flexibility of every machine purchased. The Keystone Driller Co., Beaver Falls, Pa., has produced a 1-yard power shovel which is equally usable as a 1-yard standard shovel, a 1-yard skimmer machine, a pullscoop ditching outfit and a crane with clamshell. By the use of large V-type friction wheels in the main drum and planetary gearing, it has been possible to obtain an unusual variability in the control of the line speed. The operator is able to use any line speed from 0 to 120 feet per minute for skimmer, standard shovel and pullscoop and 160 feet per minute for crane operation.

Carrying the same principle of design into the planetary sluing mechanism, it has been possible to give the machine, at the will of the operator, any desired sluing speed from zero to 5¼ revolutions per minute. Roller and ball bearings are used in the planetary gears and under the main drum and transmission shafts.

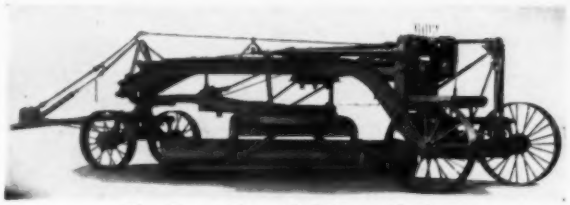
The New Model 17 1-Yard Keystone Shovel

The six types of buckets or utilities available with the Keystone Model 17 require only three different booms; first, the skimmer-pullscoop 21-foot double channel boom for operating the heavy, plunger type skimmer bucket and the characteristic line of Keystone pullscoop ditching buckets; second, the standard shovel boom, box girder type, with split 16-foot dipper sticks; third, the 40 to 50-foot crane boom, lattice type, of special tubular construction. In addition, an extension is available for the skimmer-pullscoop boom, making it either 24 or 30 feet long, and enabling the operator to change quickly from either skimmer or pullscoop to clamshell operation with very little trouble or loss of time.

The weight of the machine equipped with an 18-foot standard shovel boom and 1-yard dipper bucket, is 74,000 pounds. The weight with the skimmer, pullscoop or crane is 61,000, powered with an 82-horsepower Climax Bluestreak engine.

Seven Levers Operate New Power-Controlled Grader

THERE are seven levers in a row in front of the operator of the new Caterpillar Sixty grader recently placed in production by the Caterpillar Tractor Co., Peoria, Ill. Each lever controls action in one direction when pushed forward and in the opposite direction when pulled back. Five of the levers control the most frequently made adjustments. The sixth, through a shift, controls either the center shift or



The Power-Controlled Sixty Grader

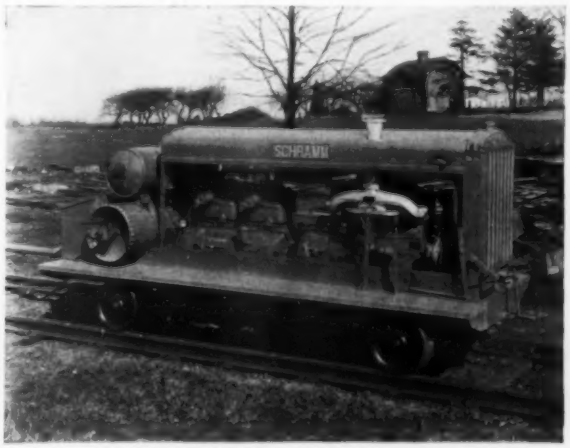
three point control. The seventh through a shift, controls either the lean of the two rear wheels or the side shift of the rear axle, a total of eighteen power-controlled actions.

The power-control mechanism is of the same type as on the Auto Patrol, the control levers engage sliding jaw clutches to direct the power, transmitted through the constantly operating gears, to the points of action. The power to operate the controls is provided by the engine mounted on the grader. It is a single-cylinder Caterpillar engine with 3⅝ inches bore, 4-inch stroke, and developing 5 horsepower at 1,300 rpm. The weight of the complete unit is 11,950 pounds.

A Self-Propelled Railroad Compressor for Any Gage Truck

A SELF-PROPELLED air compressor mounted on a standard or industrial gage railway car has been announced by Schramm, Inc., West Chester, Pa. The standard gage unit will undoubtedly be used chiefly by railroads as the same engine that drives the compressor unit propells the outfit by means of a heavy chain drive. The rail car compressor construction has the advantage of a clutch which enables the operator easily and quickly to disconnect the compressor from the engine so that the car may be propelled without wear on the compressor. The rail cars are equipped with hand brakes, a substantial running board, tool box and transverse wheels for derailing. A lifting bale for hoisting the entire unit is supplied as standard equipment.

Four sizes are built in gasoline engine drive, 120, 180, 240 and 360-cubic foot displacement. The Schramm rail car compressor will operate up to a speed of 20 miles per hour in either forward or reverse. The industrial gage unit will prove interesting to contractors using industrial equipment in rock cuts on highway work where the compressor can be shunted off on a spur track and the air lines carried ahead.



A New Self-Propelled Rail Car Compressor

A New Trench Hoe with Pick Action

A More Effective Trench Hoe

A SPECIALLY designed trench hoe which secures pick action without dropping the boom has been announced by Bay City Shovels, Inc., Bay City, Mich. This trench hoe has 3-line 2-lever control and is built in ⅜ to 1-cubic yard sizes with cutting widths from 15 to 54 inches. With the 2-lever control it is possible for the operator to hold the boom in stationary position and pick independently of the boom hoist by using the positive reverse crowd mechanism that is used in crowding a shovel dipper.

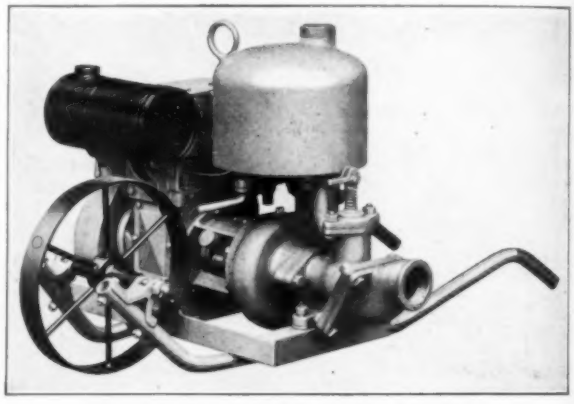
By simply moving one lever forward or backward the scoop itself moves up or down on the boom end pivot pin. This quick and easy action produces less strain on the boom handle and working parts and the manufacturer states that it reduces upkeep costs, increases efficiency and makes it possible to dig harder material with less skill and effort required of the operator.

An Hydraulic Dump Unit for 1½-Ton Trucks

THE Heil SL heavy-duty hydraulic dump unit for mounting on 1½-ton chassis and which is durable, powerful and fast, is manufactured by the Heil Co., 3000 W. Montana St., Milwaukee, Wis. This unit consists of a self-contained cast-cylinder Heil hydraulic hoist mounted in a sturdy hoist supporting frame, a body to be selected from one of the Heil SL models, a power take-off and connecting parts and cab controls. The complete unit can be quickly and easily mounted on any 1½-ton short wheel base truck designed for a 7-foot body.

The Heil SL Heavy-Duty Dump Unit for 1½-Ton Trucks

Among the features of this unit are the alternate pump gear shaft providing for clockwise or counter clockwise pump drive, the integral Heil hoist pump fastened directly to the hoist cylinders, the integral oil duct cored into the cylinder casting, the nickel-iron cylinder casting, the cross-head shaft firmly attaching the hoist piston rod to the bearing blocks, the tailgate control handle easily accessible from the cab, the offset type tailgate hinges, and the channel iron hoist frame which forms a sturdy support for the hoist and body assembly.

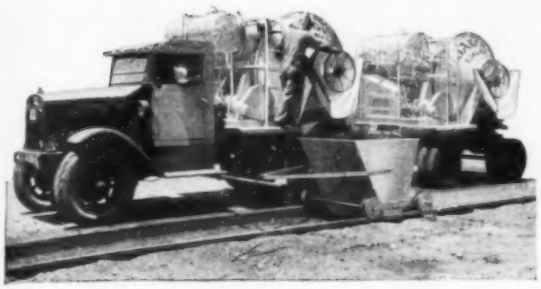


The New Rex 2½-Inch Self-Priming Pump

A New 12,000-GPH Portable Self-Priming Pump

A NEW 2½-inch self-priming centrifugal pump, of the recirculating type, automatic in action after the recirculating system has been filled, has recently been announced by the Chain Belt Co., 1666 West Bruce St., Milwaukee, Wis. This new model is designed to provide the same light weight portability of the 2-inch class with the increased capacity of the 2½-inch class. Tests show that this new Rex pump meets the A. G. C. 2½-inch pump rating of 12,000 gallons per hour on a 10-foot suction lift and the maximum lift rating of 25 feet. The weight of the pump is 305 pounds, its height 28 inches and its width 36 inches.

The manufacturer claims a new self-priming system which is built around a new device known as the prime control. With this the pump recirculating system can be adjusted to assure maximum capacity and minimum priming time on any suction lift. The impeller is of the open trash type with two blades instead of four, making the unit capable of handling a high percentage of solids and passing any sphere up to ⅞-inch in diameter. Power is supplied by a compact air-cooled engine. The pump and engine are mounted together on a wheelbarrow frame for easy handling. If desired, the pump and engine can be removed from this frame as a unit by loosening four bolts. A ring at the top permits it to be lowered into a hole with a block and tackle.



The New Dual Side Discharge Jaeger Truck Mixer

A Dual Side Discharge Truck Mixer

TO take care of the original building or the widening of concrete highways and the construction of curbs and gutters, a truck mixer with a discharge to either side rather than to the rear has been developed by The Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio. The side discharge increases the distance from the truck center line at which concrete can readily be discharged and permits the use of the truck mixer and its trailer longitudinally of the work, thus eliminating the delay of backing and turning the truck. By using the chute, this may be discharged toward the rear.

The new dual discharge from either side of the drum will deliver either a 2½ or 5-cubic yard batch in less than one minute. For road widening work a small inexpensive distributing box as illustrated is fastened to a quickly removable pipe on the truck chassis. This box, drawn along with the mixer, spreads the concrete as rapidly as the batch is discharged. Thus the daily yardage is limited only by the number of trucks operated and the amount of road bed prepared to receive the concrete. For road building purposes, a Jaeger spreader in 10-foot or other widths is available.

A New Line of Engines for Construction Equipment

A NEW line of engines claimed to have increased efficiency, smoother operation and longer life, has recently been announced by the Waukesha Motor Co., Waukesha, Wis. These new Full-Power engines are more conservatively rated than previous models, making it possible for the user to utilize his engine for all regular requirements without having to draw on the engine for its full capacity.

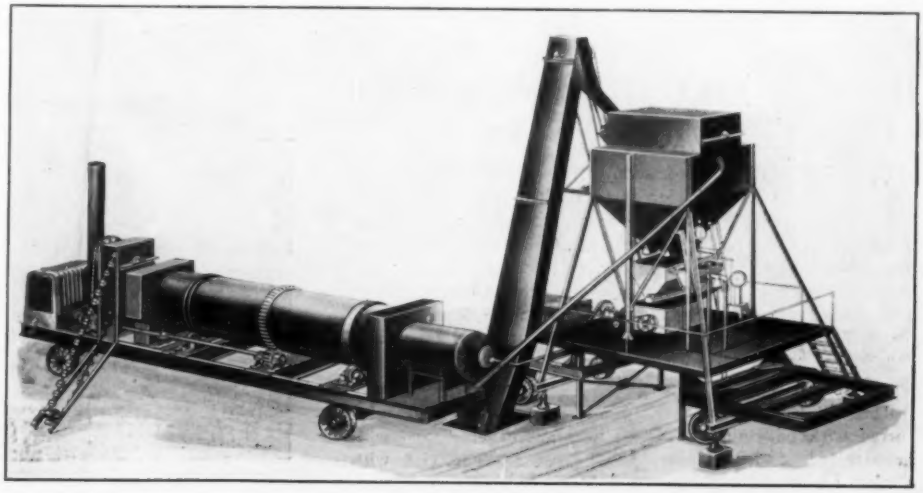
One of the features of these new engines, the combustion chamber design of which is based on the Ricardo principle, is the new metals used in its manufacture. Waukesha Alloy 221, a new metal recently developed in the Waukesha laboratories, is a special iron for cylinders with the hardness of chrome nickel steel and a tensile strength equal to machine steel. Another new iron alloy was developed for the exhaust manifolds in the Full-Power line. New bearings metals are used. The bearings are integral with the connecting rods and are cast from electrically-controlled babbitt pots by centrifugal casting machines. The main bearings are made of the same metal, bonded to steel backs fitted into the crankcase bearing seats. A specially developed type of iron has been built into the motor coach brake drums, designed for the hardest kind of local and high speed service.

The new Full-Power line will ultimately be complete for every service in which Waukesha engines are now used. At present three sizes of sixes rated at 90, 110 and 125-horsepower capacity are available and others will be added to the line as rapidly as required.

Portable Road-Type Asphalt Plants

MANY of the portable road-type asphalt plants previously brought out were designed for comparatively small capacities but as a result of the use of the mechanical finisher, there has come a demand for road-type plants having larger capacities and still remaining portable. Hetherington & Berner, Inc., Indianapolis, Ind., has recently announced a new line of portable road-type plants, built in three different sizes, Models 6A, 7 and 8, having capacities of from 300 to 500 tons per day.

These complete plants are mounted on two trailers, on one of which are mounted the twin shaft pug-mill type-mixer, bin, rotary screen, weigh box, scale and power unit for driving this machinery. The bin and screen are mounted on hinged trunnions so that they may be swung down when transporting the plant. On the second trailer is mounted the internally oil-fired dryer complete with combustion chamber, blower and cold sand elevator, as well as the unit for supplying power. These plants can be equipped with gasoline power units or electric motors, and can also be furnished without power in cases where outside power is desired. The trailers are a structural steel frame of rigid construction and are equipped with rubber-tired wheels.



One of the New Hetherington & Berner Portable Road-Type Asphalt Plants Mounted on Two Trailers

The Importance of the Clutch

ONE of the most important units in every piece of construction and hauling equipment, in which the gasoline engine is the prime mover, is the clutch. It is hidden from sight and consequently is not given much thought by either owners or operators, but the clutch makes it possible to control power in the fullest sense. William J. Pearmain, Chief Engineer, Twin Disc Clutch Co., Racine, Wis., defines clutch performance as, "To connect or couple the separate parts of a mechanism and cause them to revolve at similar speeds."

A Pioneer Portable Screening, Crushing and Loading Plant in Which the Clutches Are of Paramount Importance

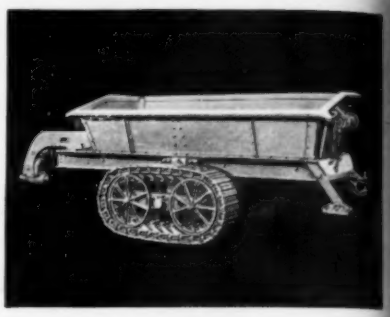
Consider a portable screening, crushing and loading plant which converts rock or gravel into various sizes of stone and sand. Here clutches are of paramount importance and a failure means an expensive shut-down. Twenty-ton gasoline locomotives haul side-dump industrial or standard gage cars on construction work. Here extra heavy centrifugal release clutches are used. On pipe line ditchers the clutch must be unusually heavy, yet very sensitive to afford correct and instantly responsive control and on the big 27-E pavers which keep going day and night, the clutch must be powerful, unfailing, and yet able to respond like a flash.

A 20-Ton Vulcan Locomotive in Which an Extra Heavy Centrifugal Release Clutch Is Used

Bottom-Dump Trailers with Crawler Tracks

FORGED-TRAK bottom-dump trailers in capacities of 5, 6, 7 and 8 yards for service with elevating graders, shovels or draglines, are manufactured by the Athey Truss Wheel Co., 130 North Wells St., Chicago, Ill. The body is of ¼-inch high carbon steel plate, well braced and reinforced around the top with 4-inch bulb angles and cast steel corner brackets. Extension sides are furnished on the 6 and 8-yard units. The front and rear ends have a modified taper and rounded corners which with countersunk rivets provide a self-cleaning body.

The full length doors are ⅜-inch high carbon steel, reinforced with bulb angles. The hinges are of cast steel with heat-treated steel pins and the sheaves are equipped with hardened pins and bushings. The hand-operated dump mechanism is of simplified design with a single hardened steel ratchet and pawl. It also has a tapered cable drum with the shaft mounted on Hyatt roller bearings. The complete mechanism is mounted on a subframe which is bolted to the body. A spring-mounted equalizer sheave minimizes shock on the cable.



An Athey Forged-Trak Bottom-Dump Trailer

A full cushioned floating drawbar is obtained by the complete spring mounting of the hitch. This hitch has a heat-treated drop forged alloy steel coupling, and all bearings of the assembly are equipped with replaceable hardened steel bushings.

One of the features of this unit is the Forged-Trak wheels with which it is equipped. The track assembly has an interlocking self-cleaning structure, with drop forged track links having interlocking arms. The high carbon rolled steel tread plates overlap and are secured to the rail with heat-treated alloy steel bolts. The new heavy-type rocker beam and wheel assembly is of a simplified design. The main axle bearing of the rocker beam is fitted with a hardened steel bushing and a centralized lubricating system is provided with large grease compartments. The track wheel bearing assembly is of greatly simplified design, with ball bearings of the single row, large ball, deep groove shielded type. The assembly is equipped with Perfect oil retainers.

A New Side Dump Body

A 1½-cubic yard side dump body which is particularly desirable for road maintenance and which can be converted from a body for carrying material to a flat bed body quickly has been announced by the St.Paul Hydraulic Hoist Co., St. Paul, Minn. The side dump features of the St.Paul special 36UB hoist and Type 459 body speed up work and eliminate maneuvering on highway work and blocking traffic. It is built with wood sills for cushioning and quieting the body, has a stationary pump with no need of a flexible hose, removable sides and a tailgate which can be lowered flush forming a platform body convenient for carrying equipment. The body has a capacity of 1½ to 2 cubic yards and dumps to one side only. It has a high dumping angle, clears the dual wheels and can be held at any dumping angle.

A Model 36UB St.Paul Dump Body

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